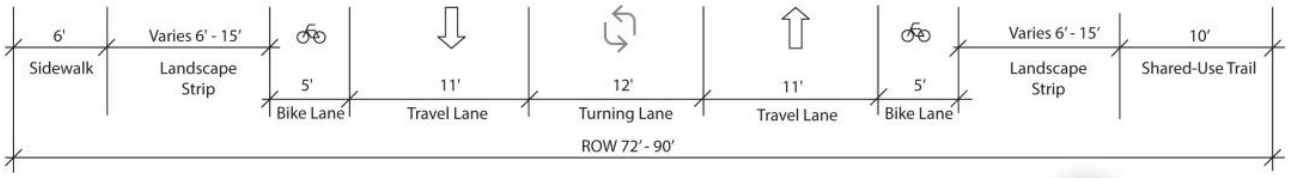
EPA Technical Assistance
Joplin, Missouri Complete/Green Streets

September 2013



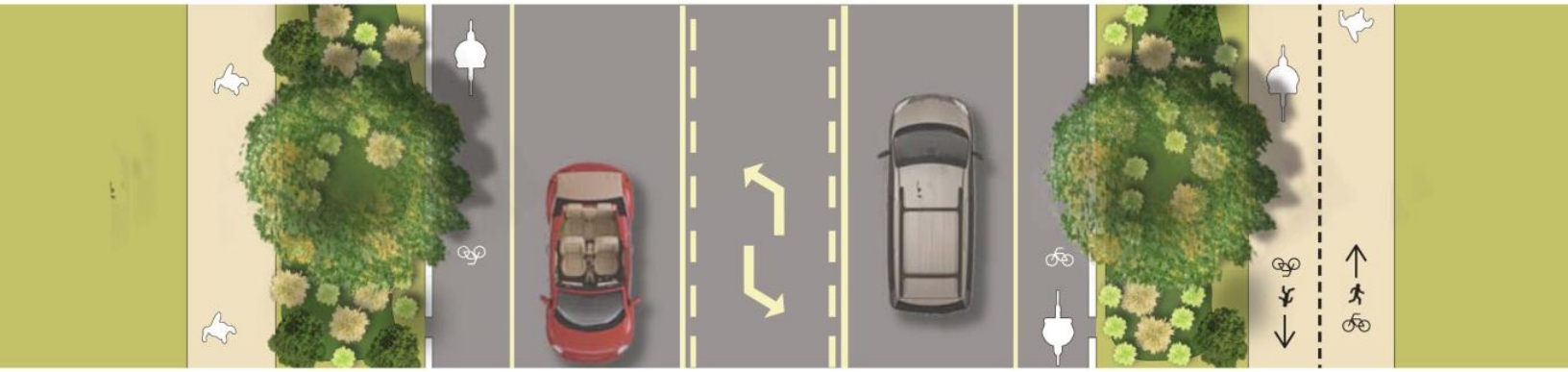


Table of Contents

Executive Summary

After a May 22, 2011 F-5 tornado forever altered the landscape of Joplin's East 20th Street corridor, Joplin residents and leaders have been presented with a chance to reposition the corridor into a model for Green/Complete Streets that can be applied to other locations throughout the community. To help facilitate that goal, the City of Joplin received technical assistance from the U.S. Environmental Protection Agency (EPA). The project came to fruition when Joplin officials and EPA staff recognized the opportunity to create a model multi-modal transportation corridor within Joplin – one that would meet the growing needs and unmet transportation demands within the community, while also addressing safety and traffic concerns along this corridor.

EPA is providing this technical assistance support for planning of a Complete/Green Street along a two-mile length of East 20th Street and a 5-block length of South Highview Avenue.

Complete/Green Streets are becoming more common as communities try to lower their long-term operation and maintenance costs, compete in an increasingly demanding economic environment, and attract new residents with aesthetics and alternative lifestyle opportunities. Communities are revisiting transportation corridors and access to jobs, community amenities, retail, and civic destinations.

Complete/Green Streets provide an opportunity for a community to embrace alternative multi-modal transportation options and environmentally appropriate management of stormwater along existing transportation corridors. The transportation corridor encompassing East 20th Street and South Highview Avenue is currently used as a main arterial motor vehicle thoroughfare and could serve as an example of positive, sustainable, and alternative uses and reuses.

COMPLETE/GREEN STREETS BENEFITS

- Accommodate multiple transportation uses, for people of all ages, abilities, and incomes;
- Enhance pedestrian safety by adding sidewalks, crosswalks, and signalized intersections;
- Serve as a catalyst for future redevelopment;
- Improve water quality by removing contaminants from the stormwater and creating less pollution;
- Reduce stormwater flows by diverting stormwater from entering the storm sewer system, which supports sustainable stormwater management and encourages lower infrastructure costs for both operation and maintenance;
- Reduce the urban heat island effect by adding vegetation and utilizing materials that reflect the heat from the sun;
- Improve the quality of the environment by making it more sustainable and reducing its carbon footprint; and
- Beautify neighborhoods by creating an amenity that will improve property values and enhance aesthetics.

To understand the opportunities and challenges related to implementing Complete/Green Streets within Joplin, the existing conditions of the East 20th Street and South Highview Avenue corridors were observed. Initial observations and considerations along the corridor are described herein. Based on community input, real time observation, and meetings with Joplin leaders, recommendations for implementing a Complete/Green Street plan are provided within this report.

Additional technical assistance provided to Joplin includes a review of current policies and codes to determine applicability for the implementation and long-term operation and maintenance for Complete/Green Streets. EPA and the City of Joplin also held community input sessions to receive feedback on several options for the Complete/Green Streets.

EPA Technical Assistance – Joplin, Missouri

EPA is providing technical assistance support to the City of Joplin for planning a Complete/Green Street along a 2-mile length of East 20th Street and a 5-block length of South Highview Avenue. The project came to fruition when Joplin officials and EPA staff recognized the opportunity to create a model multi-modal transportation corridor within Joplin—one that would meet the growing needs and unmet transportation demands within the community, while also addressing safety and traffic concerns along these two roadways.

Figure 1: EPA and Joplin officials touring East 20th Street.

In February 2013, EPA's consultant team (the SRA Team), along with EPA staff, visited Joplin to analyze the corridor and identify opportunities to design a Complete/Green Street. During this site visit, the SRA Team worked with Joplin officials and EPA to identify five initial nodes based on varying uses along the corridor and key intersections; this analysis helped organize designs and potential implementation. The initial nodes identified are:

- **South Main Street Intersection:** East 20th Street from South Main Street to South Pennsylvania Avenue*
- **High School:** East 20th Street from South Iowa Avenue to South Illinois Avenue*
- **Library/Theater Project:** East 20th Street from St. Louis Avenue to South Patterson Avenue
- **Campbell Parkway:** East 20th St. from Campbell Parkway (SE Murphy Blvd) to South Arizona Avenue
- **South Highview Avenue:** South Highview Avenue from East 17th Street to East 22nd Street

* *The South Main Street and High School nodes were later combined due to community feedback and other plans underway, such as the final plan for the construction of a viaduct on 20th Street over the Kansas City Southern Railroad tracks.*

The SRA Team provided support to Joplin during the initial planning phases, including development of a baseline assessment memo and baseline condition maps to ensure that opportunities and challenges were captured and defined within the corridor boundary (see Appendix IV). In addition, SRA Team facilitators, EPA and the City of Joplin hosted public design workshops (June 2013) seeking community input on the various Complete/Green Street design elements and opportunities. SRA Team members also finalized designs and met with various city staff and departments. Further, the SRA Team reviewed existing codes and policies and provided recommendations to support Complete/Green Street implementation (see Appendix VII).


Figure 2: Joplin Public Design Workshop.

Figure 3: Interaction with residents during the Public Design Workshop in June 2013.

Based on the initial analyses and multiple community meetings (Appendix VI), this report makes recommendations to Joplin leaders and policy makers on implementing Complete/Green Street projects along East 20th Street and South Highview Avenue. Recommendations provided within this report also align with the Citizens Advisory Recovery Team (CART) implementation plan.

Study Area Overview

On May 22, 2011, a tornado rated EF5 on the Enhanced Fujita Scale ripped through the heart of Joplin, Missouri with top winds of over 200 mph—altering the landscape along a ¾ to 1-mile wide and 6-mile long path. The storm impacted approximately 8,000 structures including homes, businesses, schools, churches, and a hospital. Additionally, public infrastructure, such as utilities and storm sewers, and the natural environment were also affected. The tornado's path included a 2-mile corridor, along East 20th Street between South Main Street and South Highview Avenue, with nearly all development, infrastructure, and environmental elements damaged or destroyed. While this natural disaster was a catastrophic event, it presents a unique opportunity for Joplin to embrace change and to complete redevelopment projects along this transportation corridor that meet their new, sustainability goals. A sustainable community is one that is economically, environmentally, and socially healthy and resilient. Redevelopment has already begun along the corridor, with some property owners rebuilding what was destroyed, while other property owners are waiting to consider their options and to review the vision and plans for East 20th Street and South Highview Avenue.

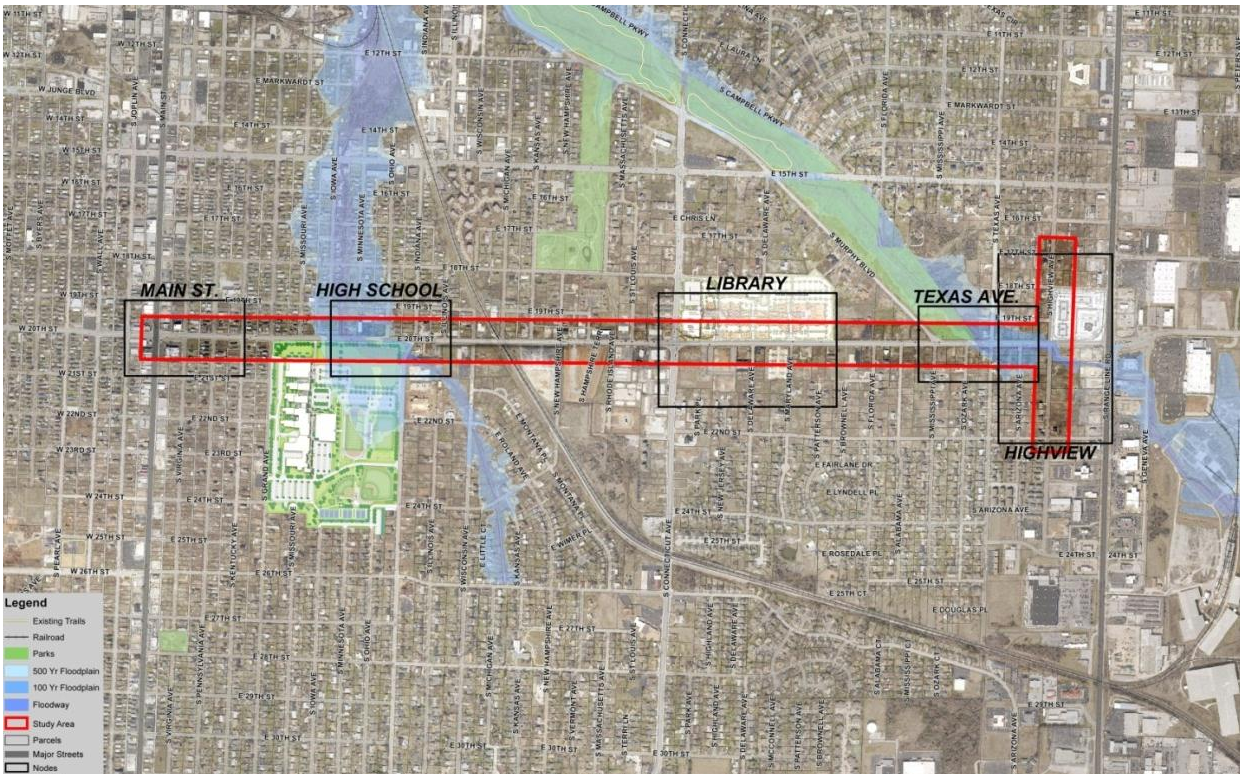


Figure 4: East 20th Street and South Highview Avenue Study Area Identifying the Five Initial Nodes.

Based on initial designs and discussions, the SRA Team identified five key intersection points (nodes) within the transportation corridor (Figure 4). The South Main Street and High School nodes were later combined due to community feedback and other plans underway, such as the final plan for construction of a viaduct on 20th Street over the Kansas City Southern Railroad tracks. In addition, combining this stretch of the corridor as one node will ensure a smoother transition during increased peak traffic times around the high school (during morning drop-off and afternoon dismissal).

In order to understand the opportunities and challenges related to implementing Complete/Green Street projects in Joplin, the existing conditions of the corridor were observed and analyzed. The following section outlines some of the initial observations and considerations.

Existing Transportation Operations and Character

East 20th Street

Road Characteristics. East 20th Street between South Main Street and South Range Line Road is currently a five-lane arterial roadway with two traffic lanes in each direction (east to west), as well as a continuous center left-turn lane. The pavement width is 60 feet from curb to curb while the public right-of-way (ROW) varies along the corridor from a minimum of 72 feet to a maximum of 90 feet in width. The average ROW width throughout the corridor is approximately 78 feet. During the workshop site visits, traffic was observed as consisting of a mixture of vehicular and truck traffic. Although the posted speed limit is 35-miles per hour, the actual speed of travel appeared to be relatively high for an urban roadway within what is primarily a residential area.

Traffic Counts. Within the East 20th Street corridor, traffic counts vary at different points along the corridor. The following table provides an overview of the average daily traffic (ADT) counts along East 20th Street with a comparison between pre-tornado and current counts. As expected, traffic counts are currently lower than the pre-tornado numbers. However, when the new Joplin High School opens in 2014, the traffic counts are expected to rise closer to the pre-tornado levels.

TABLE 1: TRAFFIC COUNTS

Intersection	Pre-tornado ADT (2009)	Current ADT (2013)	Corresponding Node
East 20th Street at Main Street	N/A	11,808	Main Street to High School
East 20th Street	At S. Minnesota Ave. 17,717	At Ohio Avenue 10,989	Main Street to High School
East 20th Street at South St Louis Avenue	N/A	13,864	Library
East 20th Street	At Delaware Avenue 14,256	At S. Connecticut Ave. 12,533	Library
East 20th Street at Arizona Avenue	15,449	14,183	Campbell Parkway

Data provided by the City of Joplin.

Figure 5: Photos of East 20th Street showing five-lane configuration (left) and 35-mph posted speed limit (right).

Speeding. Although the average roadway ROW is 78 feet wide, East 20th Street gives the appearance of being even wider, which likely contributes to higher traffic speeds. Some of the contributing factors include:

- Crosswalks are missing, faded, or are not of the high-visibility "ladder" style at several intersections.
- Sidewalks are not consistent or continuous along the corridor and there are very few locations where they exist on both sides of the roadway.
- There are no trees along long stretches throughout the corridor. Trees have a tendency to create an enclosure, and without them, the roadway appears to be wider and less constricting.
- There is limited traffic signalization, allowing motorists to travel unimpeded through the corridor. This affirms the mindset of some motorists that East 20th Street is a thoroughfare, and one on which they can quickly drive east or west across town.
- Because there has not been much redevelopment since the tornado, there are few true destinations where vehicles need to slow down to enter parking lots and slow the traffic behind them. When the envisioned anchor projects, such as the library, movie theater and grocery store, come to fruition, the dynamics and traffic speed along the corridor may change.

Trolley. The Sunshine Lamp Trolley (Green Route in Figure 6) currently travels eastbound along East 20th Street between South Main Street and South Range Line Road and has five stops throughout the corridor in the following locations:

- In front of Walgreen's at South Main Street;
- At Joplin High School in the vicinity of South Iowa Avenue;
- At the former Dillon's location at South New Hampshire Avenue;
- At South Delaware Avenue near a cluster of multi-family residential units; and
- At South Mississippi Avenue near Campbell Parkway.

When the envisioned anchor projects come to fruition, additional locations may be considered, such as the library, movie theater, and new multi-family housing complexes.

Figure 6: Map of the Sunshine Lamp Trolley Route through the East 20th Street Corridor (Green Route).

Pedestrian accommodations along the East 20th Street corridor are poor due to the lack of continuous sidewalks, pedestrian crosswalks, and pedestrian signalization in many locations. The residents utilizing the trolley system do not have a safe pedestrian connection between destinations and trolley stops. Connectivity and consistency in any future sidewalk placement will be important to revitalize the corridor and attract pedestrians.

Figure 7: Both images show the lack of sidewalks on either side of the roadway, which discourages pedestrian use of the corridor.

South Highview Avenue

The study area on South Highview Avenue is from East 17th Street to East 22nd Street, which is primarily a residential street. South of East 20th Street, the adjacent residential parcels face South Highview Avenue; north of East 20th Street the parcels face either East 17th Street, East 18th Street, or East 19th Street. This section of South Highview Avenue has a fairly wide cross section. The pavement width is approximately 40 feet from curb to curb, which is extremely wide for a residential street. This width likely contributes to one of the major problems along South Highview Avenue, which is vehicles using South Highview

Avenue as a bypass around South Range Line Road to avoid waiting at any of the traffic signals along South Range Line Road.

Figure 8: Images of South Highview Avenue showing the wide pavement width.

Another issue with South Highview Avenue is the commercial development fronting on South Range Line Road. Commercial businesses are currently being constructed on the east side of the street between East 17th Street and East 20th Street (Figure 9). This development will bring noise and truck traffic that is not compatible with the adjacent residential development. Traffic calming and buffering should be applied around the new or any existing commercial developments.

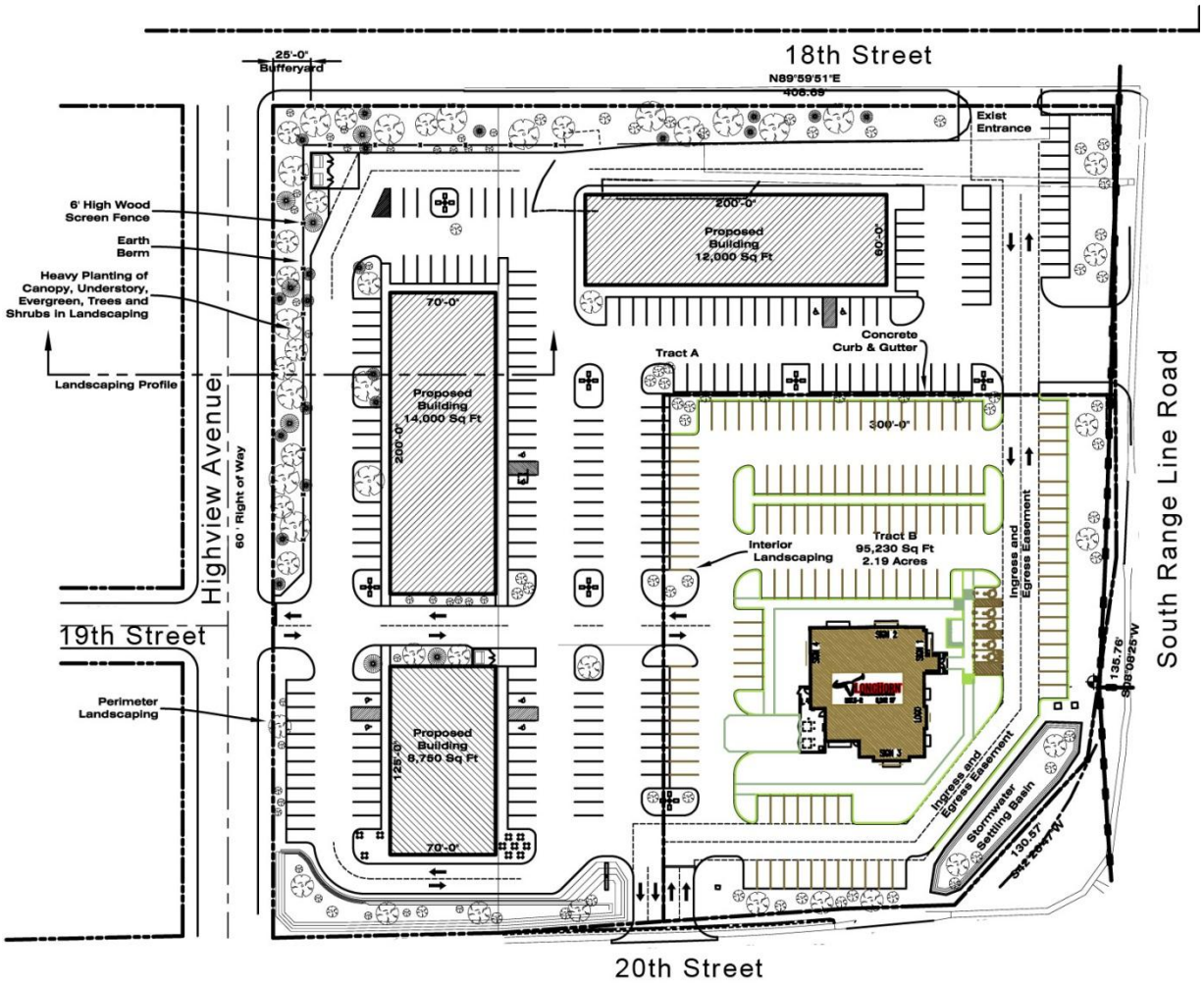


Figure 9: Recent Site Plan on South Range Line Road backing onto South Highview Avenue. [Source: O'Donnell III Architect.]

Stormwater Conditions

The study area has two major drainage areas, which are divided by the KC Southern Railroad tracks. The western portion of the corridor drains toward the Iowa Avenue Branch of Joplin Creek in the vicinity of Joplin High School. The eastern portion drains to Joplin Creek near Campbell Parkway. Joplin is a Municipal Separate Storm Sewer Systems (MS4) community, with a drainage system designed to handle 25- to 50-year storm events for main streets and 10-year storm events for side streets. Joplin has obtained Federal Emergency Management Agency (FEMA) funding for stormwater repairs (catch basins) along East 20th Street. This funding should be coordinated with the Green Street features proposed herein.

In addition, Joplin is currently in the process of acquiring additional properties near Campbell Parkway along the south side of East 20th Street for stormwater improvements adjacent to Joplin Creek. These stormwater improvements are part of the Department of Transportation (DOT) Tiger Grant 20th Street

sidewalk project. For the design phase of stormwater projects, EPA has developed a tool known as the National Stormwater Calculator[1] that may be useful in estimating annual runoff amounts based on rainfall frequency, soil conditions, and land cover.

Figure 10: Photos of the existing Joplin Creek through Campbell Parkway (left) and as a channelized ditch near South Highview Avenue (right).

[1] http://www.epa.gov/nrmrl/wswrd/wq/models/swc/

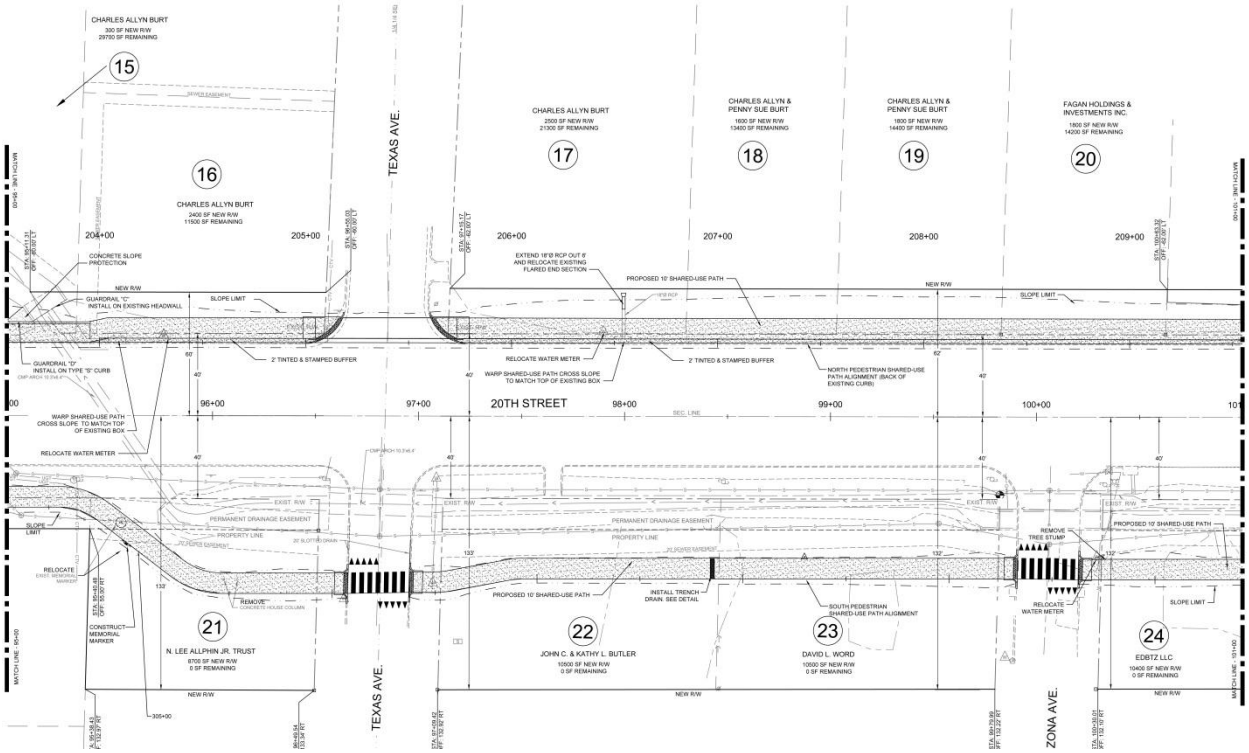


Figure 11: Draft Sidewalk Plans for East 20th Street, including a shared-use trail and additional space to accommodate stormwater management areas. [Source: Tri-State Engineering.]

Complete/Green Street Opportunities

Complete/Green Street initiatives are occurring throughout the country, including multiple locations in the Midwest (see Appendix I). These streets are becoming more common as cities try to lower their long-term operation and maintenance costs, compete in an increasingly demanding economic environment, and attract new residents with aesthetics and alternative lifestyle opportunities. Statistics show that teenagers are waiting longer before they obtain their initial drivers' licenses, and many families do not own a motor vehicle. Communities, in competition with others, are revisiting transportation corridors and their connection to jobs, community amenities, retail, and civic destinations along with seeking to accommodate people who do not wish to or cannot travel by motor vehicle.

Complete/Green Streets provide an opportunity for a community to embrace alternative multi-modal transportation options and environmentally appropriate management of stormwater along existing transportation corridors (see Appendix II for additional information on green infrastructure practices). The transportation corridor encompassing East 20th Street and South Highview Avenue is currently used as a main arterial motor vehicle thoroughfare and could serve as an example for positive, sustainable, and alternative uses. With the proposed development plans for the corridor, including the new Joplin High School, library, movie theater, mixed-use development plaza, and Campbell Parkway improvements, the corridor has an opportunity to embrace the natural designation of a civic-use corridor and improve the user experience among these development projects.

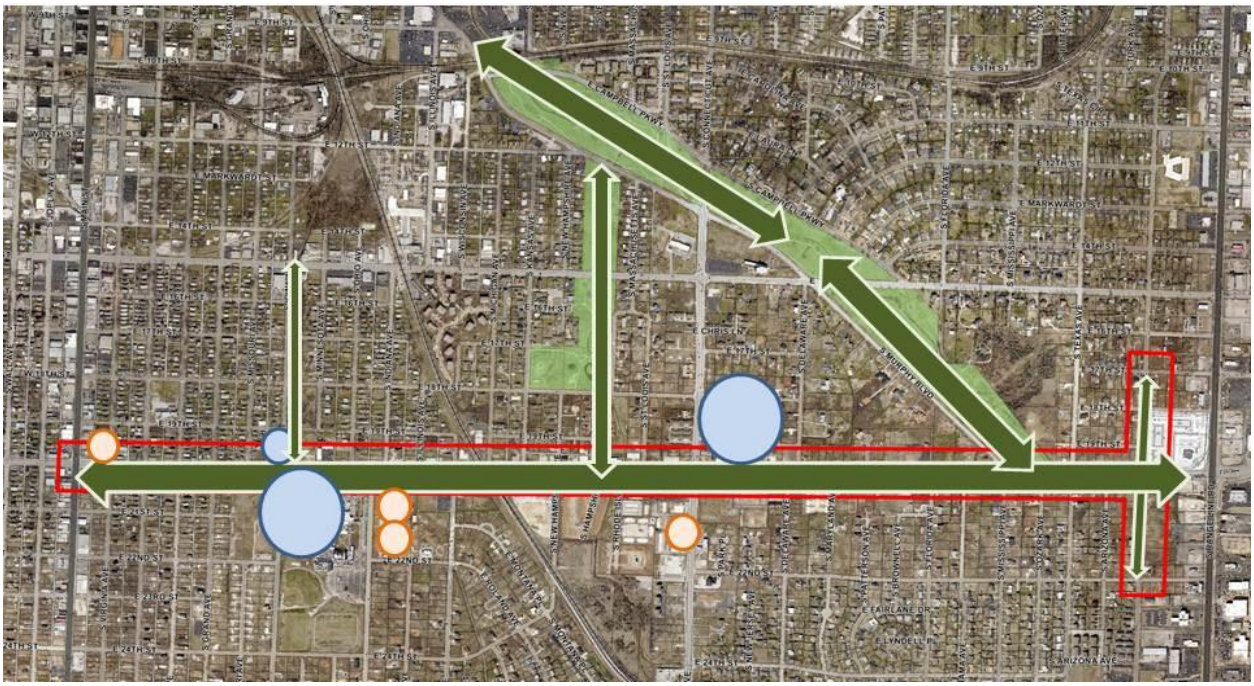


Figure 12: Location of public and civic uses along the East 20th Street and South Highview Avenue corridor.

Many public and civic-based redevelopment projects are either under development or planned for East 20th Street. The high school, library, theater (blue dots in the image above), churches (orange dots), and parks (green lines) promote multiple uses by all age groups. Some of the proposed uses may encourage a higher volume of pedestrian flow. For instance, the high school and proposed theater will likely cater to a population that is not old enough to drive a vehicle. Many of these individuals may use bicycles or

walk to their destinations. Additionally, existing churches, as well as the proposed library, will attract older residents who might not want to drive (or residents/citizens that may not have a motor vehicle) and instead opt to utilize public transportation. Complementary uses in these areas will also promote bicycle and pedestrian traffic crossing East 20th Street, such as people traveling from the high school to the Sunny Jim baseball fields, or from the future library and theater complex to Casey's, a new convenience store and gas station located on the southeast corner of East 20th Street and South Connecticut Avenue. Multi-family housing developments being constructed and planned along the corridor will generate many potential users for the civic uses just mentioned.

COMPLETE/GREEN STREETS BENEFITS

- Accommodate multiple transportation uses for people of all ages, abilities, and incomes;
- Enhance pedestrian safety by adding sidewalks, crosswalks, and signalized intersections;
- Serve as a catalyst for future redevelopment;
- Improve water quality by removing contaminants from the stormwater and creating less pollution;
- Reduce stormwater flows by diverting stormwater from entering the storm sewer system, which supports sustainable stormwater management and encourages lower infrastructure costs for both operation and maintenance;
- Reduce the urban heat island effect by adding vegetation and utilizing materials that reflect the heat from the sun;
- Improve the quality of the environment by making it more sustainable and reducing its carbon footprint; and
- Beautify neighborhoods by creating an amenity that will improve property values and enhance aesthetics.

East 20th Street and South Highview Avenue Corridor Implementation

Initial Considerations and Guidance on Implementation

To understand the opportunities and challenges related to implementing Complete/Green Streets in Joplin, the existing conditions of the East 20th Street and South Highview Avenue corridors were observed. Based on the existing conditions noted in the Study Area Overview described above, the following information describes initial observations and considerations along the corridor.

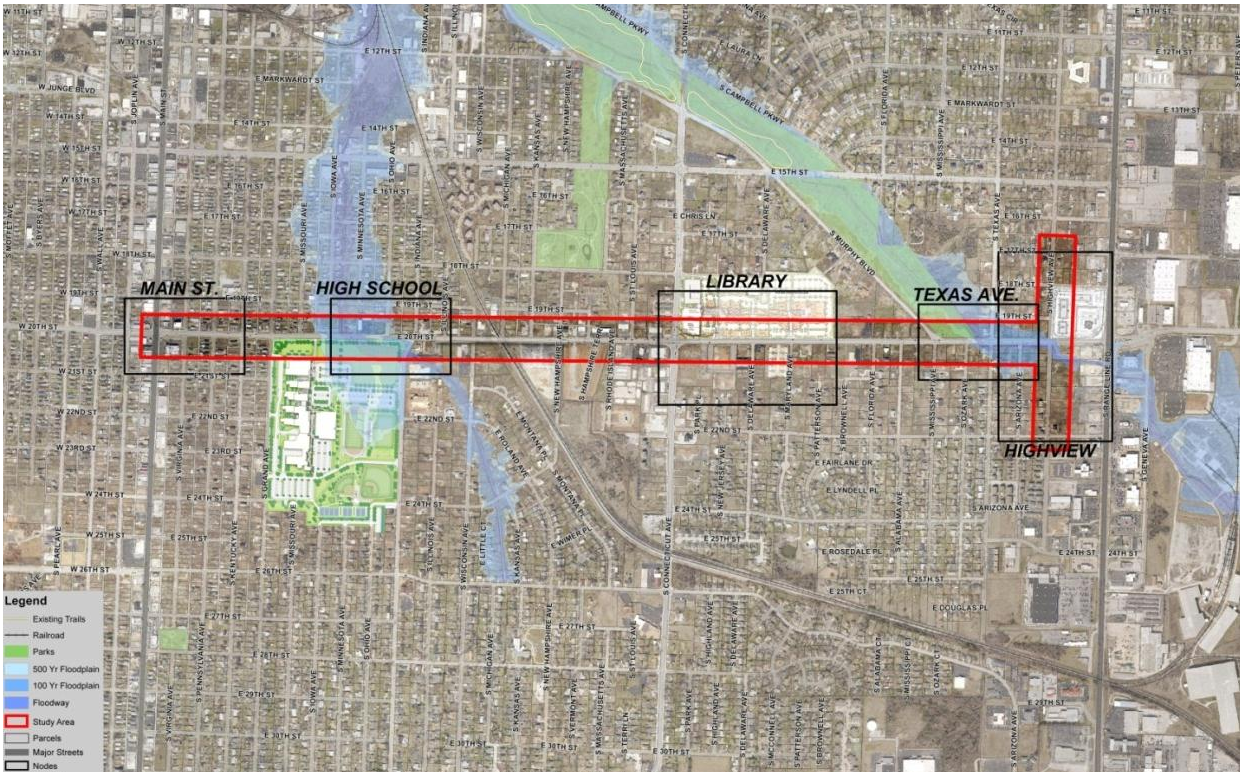


Figure 13: Corridor Map.

Design Considerations

The SRA Team obtained and evaluated a variety of information provided by the City of Joplin, including ROW and pavement widths, number of traffic lanes, locations of transit stops, drainage patterns, infrastructure, traffic counts, topography, and development patterns and regulations.

The amount of available ROW for changes or improvements is a primary consideration in the future implementation of any Complete/Green Street project. The ROW needs to accommodate street pavement, sidewalks, infrastructure,

Figure 14: Minimal available ROW outside of the roadway in this location near South New Hampshire Avenue.

landscaping, as well as other public elements. On East 20th Street, ROW widths generally range between 72 to 90 feet, with the average ROW being approximately 78 feet. With the current roadway width of 60 feet, between 6 and 15 feet per side was left to accommodate amenities without changing the current roadway configuration. The figure below compares the space that is available to accommodate amenities when the lane configuration of the roadway is altered. The current five-lane configuration is not conducive to accomplishing Joplin's goal of creating a Complete Street as there is now only sufficient ROW available to accommodate a new sidewalk on either side of the roadway. This does not provide enough space to meet the goals of other transportation types. Creating a Complete/Green Street becomes more viable by narrowing the roadway to either a three- or four-lane section.

One technique of converting an existing roadway into a Complete Street is to put it on a "road diet". A road diet is typically utilized on roadways having excess vehicle capacity. In most of these instances, one or more travel lanes can be eliminated in favor of bicycle lanes and other features, such as left-turn lanes or on-street parking. The most common type of road diet project is the conversion of a four-lane undivided roadway into a two-lane roadway with a continuous center left turn lane and bicycle lanes on both sides of the road.

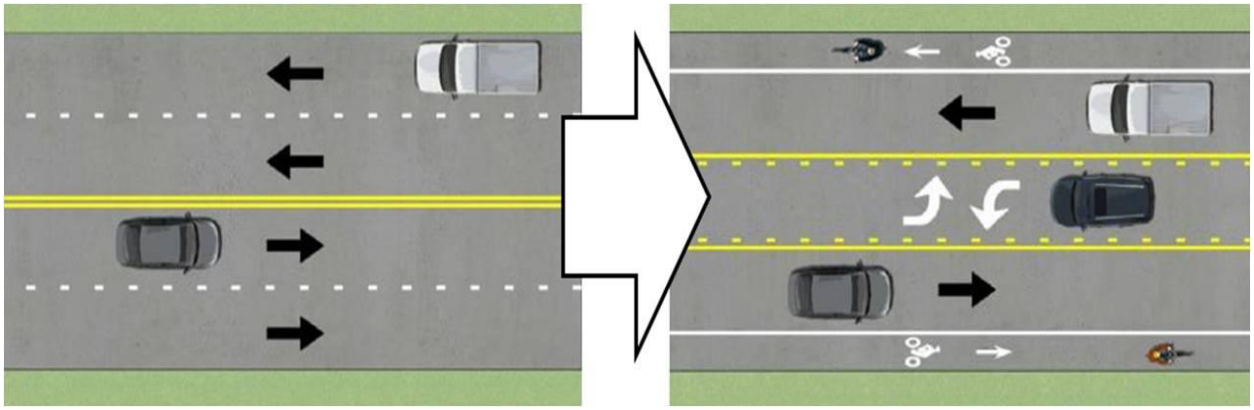


Figure 15: Diagram showing a typical road diet from four lanes to three lanes[2].

[2] http://www.pps.org/wp-content/uploads/2012/12/Before-and-After-Typical.jpg

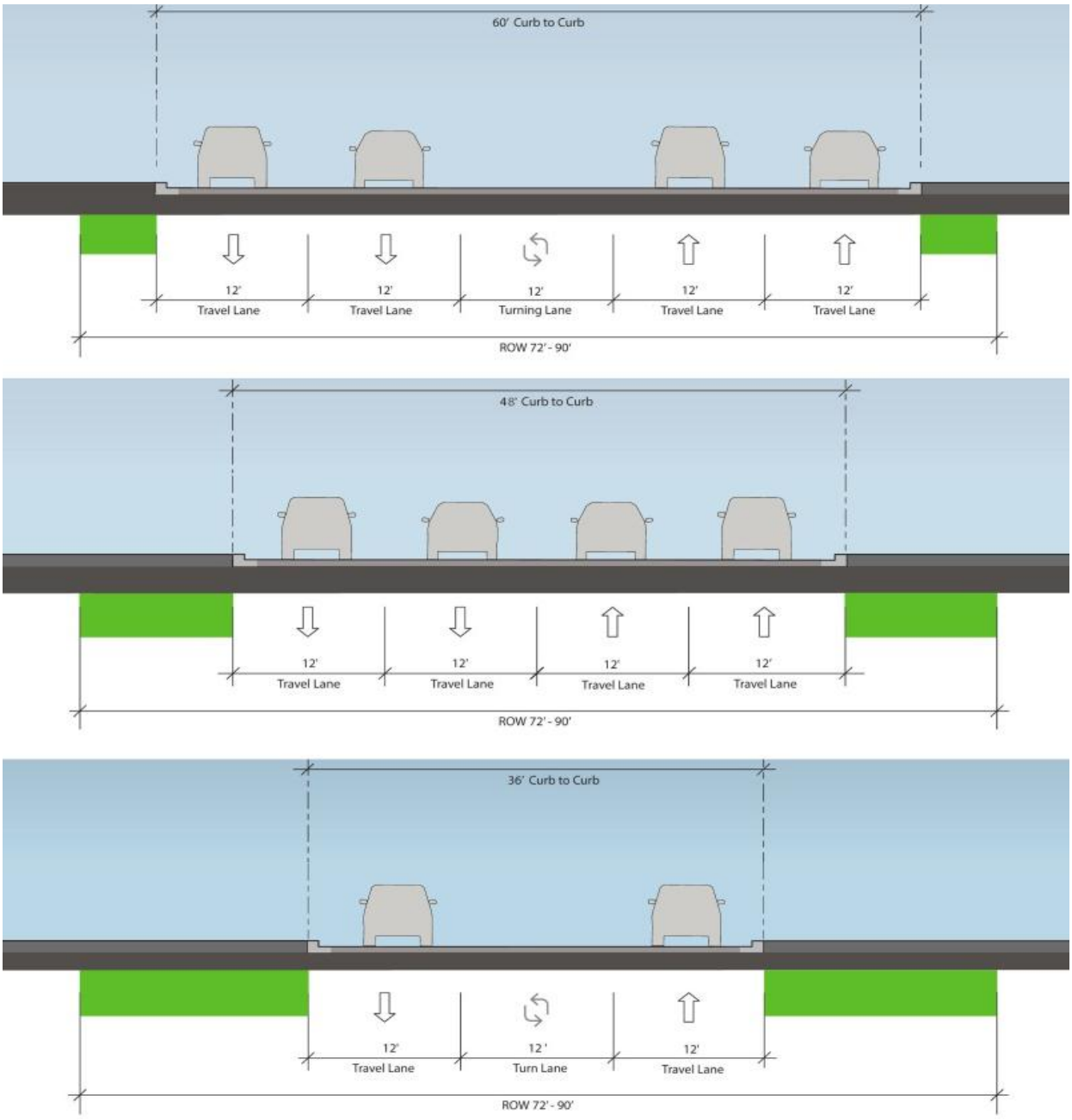


Figure 16: Diagram showing available space (in green) to accommodate sidewalks, bicycle lanes, landscaping, and other features under the current five-lane street section (top), and the alternate four (middle), and three (bottom) lane sections.

Within the East 20th Street and South Highview Avenue corridor, the Complete/Green Street features addressed in the Complete/Green Street Opportunities section are all achievable. Green infrastructure practices can significantly alleviate flooding and nuisance ponding in the public rights-of-way and private properties, as well as ease the burden of excessive stormwater flow on the city's storm sewer

system. The Center for Neighborhood Technology (CNT) has created a National Green Values Calculator[3] that quickly compares performance, costs, and benefits of various green infrastructure practices versus conventional stormwater practices. Tools like this can aid in Joplin's initial determinations of what features are desirable and achievable in certain locations.

Complete/Green Street components proposed for Joplin include utilizing a road diet, Adaptive Traffic Control, pedestrian and bicycle amenities, public transit amenities, and green infrastructure. For specific information about each of these components, please see Appendix III (Complete/Green Street Components).

City of Joplin Guidance

Local policy makers can have a substantial impact on the successful implementation of Complete/Green Streets within the City of Joplin. The SRA Team recommends that the city update the Comprehensive Plan and Zoning Regulations and utilize Complete/Green Street features in its capital projects. Appendix VII lists the recommended changes and enhancements to incorporate Complete/Green Streets in city regulations and projects.

Future land use and zoning designations are likely to impact the type, amount, and density of development along the East 20th Street and South Highview Avenue corridor. It is also recommended that the City of Joplin complete a market research study to determine what type and number of businesses may be supported along this corridor, given the existing commercial corridor of South Range Line Road and the historic business district of South Main Street. This market analysis, combined with the traffic counts, will give the city the ability to plan for the future multi-modal transportation needs of the corridor.

Corridor Connections

The recommendations and technical information provided in this report can serve as a model for Complete/Green Streets not only along the East 20th Street and South Highview Avenue corridor, but also throughout the City of Joplin. SE Murphy Boulevard, South Connecticut Avenue, and East 15th Street should be emphasized as these are the areas where traffic overflow may cause negative unintended consequences. SE Murphy Boulevard is a corridor connection between East 20th Street and East 15th Street. Because of its adjacent location to Campbell Parkway, there is the potential to further enhance greenspace with the inclusion of green infrastructure practices. South Connecticut Avenue is a major north-south connector and is located about halfway between South Range Line Road and South Main Street. This road has had recent upgrades to sidewalks and stormwater management. East 15th Street is mostly an older residential arterial that runs parallel to East 20th Street from South Range Line Road to just west of South Main Street. Finally, the Complete/Green Street approach can also be applied to the areas surrounding the new medical campus and hospitals to promote healthy living and opportunities to walk or bike to those office buildings and facilities.

Overall Corridor Considerations

Joplin residents currently view East 20th Street as a main transportation corridor. Redevelopment within the two-mile corridor will cause a change in the way the roadway is traveled and viewed by the public,

[3] http://greenvalues.cnt.org/national/calculator.php

especially with the addition of major civic destinations such as the high school, library, and movie theater.

Public feedback received during the design workshops indicated strong support for incorporating green infrastructure features to help improve stormwater management and the aesthetics of the corridor. Creating green infrastructure throughout the corridor will effectively manage stormwater and positively influence infrastructure operations and maintenance. Additionally, the Joplin community supports actions to include natural aesthetic components (trees, shrubbery) that will not impede infrastructure or traffic flow. It was strongly recognized that citizens want to see more connections to trails and parks and interact with nature in the corridor.

Next Steps: Recommendations on How and Where to Start

Redeveloping the entire two-mile corridor at once is a large undertaking. Certain areas along the corridor already lend themselves to support Complete/Green Street features and would be ideal places to begin such development. These particular locations include property under city ownership, controlled by large institutions such as the school district, or large assembled properties that are poised for redevelopment. Installation of features in these locations could be implemented in the short-term, while future land use decisions are still being made and city policies are finalized for the remainder of the corridor. Ideal places include the high school site, library/theater complex, and Campbell Parkway. It is recommended that the city continue to gather public input and opinion through additional public hearings and design workshops with adjacent and interested property owners.

Road Diet

Implementing a road diet on East 20th Street would require further engineering analysis to take into account the intersection level of service (LOS) for various points along the corridor. Specific next steps include:

- Conducting a planning level traffic study to test road diet concepts and see what impacts they may have on travel delay, LOS, and estimated traffic counts;
- Investigating the use of adaptive traffic control as an operational enhancement to maximize traffic throughout the corridor—this is a low-cost technology application that can optimize the roadway capacity; and
- Developing a more detailed final design once the data has been collected, which looks at specific issues related to ROW, topography, utility placement, intersection design, transit stops, sidewalk locations, bicycle accommodations, and appropriate green infrastructure.

A road diet test also can be accomplished by studying the traffic flows during the year-long construction of the viaduct over the railroad tracks, which will limit traffic along East 20th Street, impacting traffic from South Connecticut Avenue to South Main Street. In order to construct the viaduct, traffic patterns will be impacted, acting as an initial road diet. The viaduct is planned to carry four lanes of traffic.

Further Site Investigations or Studies

A number of potential opportunities for Complete/Green Street improvements were observed in the field. These observations occurred during a short time period and did not involve an in-depth evaluation or proper engineering analysis of existing conditions. Accurate survey data/mapping, additional field evaluation, and/or engineering analysis will be required before proceeding with additional plans. Potential analyses may include:

- Soil investigations to evaluate soil infiltration rates and groundwater regime to determine which green infrastructure techniques are viable along the corridor. Generally, soils with a higher content of sand, versus silt or clay, are desirable.
- Geoenvironmental characterization of site soils in terms of possible contaminants.
- Traffic and parking studies for any changes that may impact roadway capacity, corridor circulation, and parking.
- Geometric and turning movement template analysis to verify the feasibility of curb extensions and reduction in corner radii.
- Stormwater and local watershed analysis.

Opportunities and Challenges

The DOT Tiger Grant East 20th Street viaduct and sidewalk projects offer an opportunity to leverage additional federal resources within this corridor. The viaduct will have a major impact on the East 20th Street corridor. The viaduct will impact the vehicular traffic along the corridor since traffic will no longer need to wait for passing trains as they pass on the tracks below. The raised viaduct will also impact the connection between both sides of the viaduct. While the viaduct will have a sidewalk, that sidewalk may not be fully ADA accessible due to the steep slope that is required to provide sufficient clearance for the trains below. Additionally, the planned East 20th Street viaduct may attract additional traffic to East 20th Street instead of adjacent corridors like East 15th Street or East 32nd Street.

As part of the DOT Tiger Grant sidewalk project, the city will acquire four parcels on the south side of East 20th Street at Campbell Parkway. The City approved designs to construct a new sidewalk with stormwater improvements in this area. The SRA Team provided input on the design of this sidewalk to ensure its compatibility with the Complete/Green Street goals for East 20th Street.

The City of Joplin Parks Department has active or pending park improvement projects at Parr Hill Park, Campbell Parkway, and Joplin Creek. These parks offer an opportunity to provide connections to the existing 15 miles of trails within the city. As projects are completed, trails and sidewalks should include respites (benches and rest areas), shelters, bike racks, and wayfinding (maps and signage). The inclusion of trails (whether bike lanes or sidewalks) along the East 20th Street corridor will help connect some of these parks and trails.

The new Joplin High School is under construction along East 20th Street. The high school is a main hub for pedestrian activity, and there is an opportunity to provide Safe Routes to School approaches that include pedestrian-friendly intersections, bike lanes, sidewalks, and bike racks.

Recognizing that minimal redevelopment has occurred since the tornado, this is an opportunity to create and promote a corridor theme. Building from the Complete/Green Streets projects, East 20th Street can launch a new identity as a civic use corridor. This can help guide future development projects and engage the public in the revitalization of the corridor, as well as provide a theme for corridor amenities, such as benches, lighting, and public art.

EPA Recommendation Implementation

With a variety of amenities and features of Complete/Green Streets, and with the specific opportunities and challenges along the corridor, the SRA Team looked at the implementation of Complete/Green Street features for each of the individual nodes that were identified. The SRA Team identified various recommendations for each node in collaboration with EPA and city officials. While many features will

appear in all the nodes, each node was individually assessed to consider the intended users within the node, multiple modes of transportation, and stormwater management opportunities.

Based on the goals of the project, EPA recommends a road section for each node. These road sections have a defined number and width of vehicle travel lanes, bike lanes, sidewalks, and landscaped strips for green features. Further, they work within the existing ROW of East 20th Street. Throughout the workshop and discussions with the City of Joplin, various road sections were developed to illustrate the varying vehicular lane structure, features, and components available. All of the designs developed and considered are included in Appendix V. The following sections illustrate each node along with the recommended road section and design features.

MAIN STREET TO HIGH SCHOOL NODE

This section of the corridor focuses on the 0.6 mile stretch of East 20th Street between South Main Street and South Illinois Avenue. (As mentioned previously, the two initial nodes were combined based on community feedback and plans.) This node includes the new Joplin High School and the west side of the proposed viaduct over the Kansas City Southern railroad tracks. When both of these projects are completed, they will significantly change the landscape, dynamics, and use of this corridor as compared to current conditions. The construction of these projects provides an ideal opportunity to incorporate the Complete/Green Street recommendations for this node. The traffic pattern and flow will change the dynamics of the area. As can be seen in the figure below, the high school encompasses a significant portion of the overall node.

This node also contains the Iowa Avenue Branch of Joplin Creek which, as diagrammed in the image below, has a fairly significant 100-year floodplain associated with it. From East 20th Street to South Wisconsin Avenue, Joplin Creek is buried underground in pipes, which, during flooding conditions, can carry only a finite quantity of stormwater. Therefore, up-stream and above-ground stormwater management features constructed in this node have the potential to reduce the amount of stormwater the underground pipes would need to carry. 100-year floodplains are the first place large quantities of stormwater will collect. The South Iowa Avenue branch of the Joplin Creek and the northeast corner of the high school property are ideal places to include green infrastructure practices to help manage stormwater. As this is the low point where stormwater from East 20th Street collects, from the viaduct to South Main Street, the green features recommended for this road section will slow stormwater from reaching the underground pipes and the floodplain area.

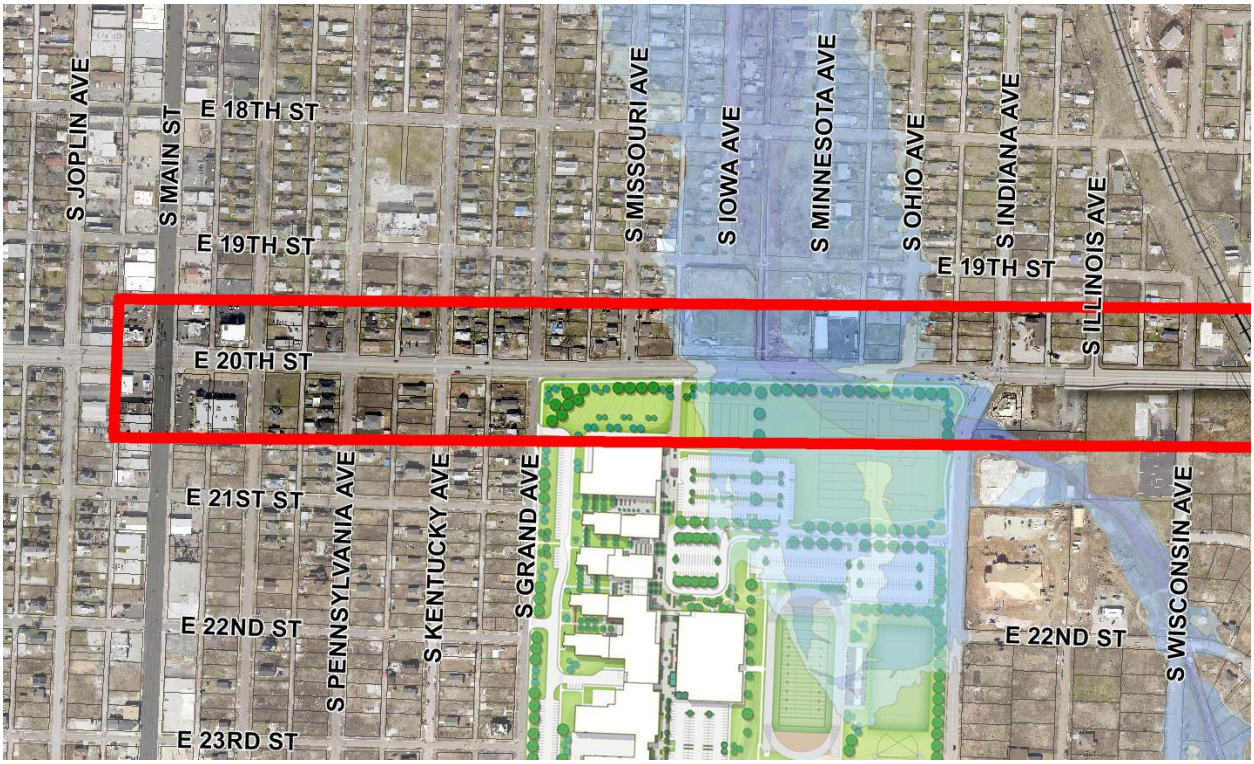


Figure 17: Aerial view of the Main Street to High School node.

Figure 18: East 20th Street looking east towards the high school development.

Figure 19: East 20th Street looking west at the future viaduct location.

Once Joplin High School opens in 2014, all modes of transportation along this section of the corridor are anticipated to increase. The incorporation of Complete/Green Street components would enhance safety and help manage the increase in pedestrians, bicycles, buses, and motor vehicles, especially at peak school hours in the morning and afternoon. Traffic accessing the high school will enter from both South Indiana Avenue as well as South Grand Avenue, on the east and west sides of the high school property; some traffic will access the high school from the south. Many of these users will utilize East 20th Street prior to turning onto either South Grand Avenue or South Indiana Avenue. During the first year of operation, while the viaduct is under construction, alternative routes may be utilized to access the high school.

Complete/Green Street Implementation Recommendation

Number of Lanes: 4 (2 eastbound, 1 westbound, continuous center left-turn lane)

Current ROW: Generally 80 feet, with a few exceptions where it is wider

Lane width: 11’ driving

Bicycle/Pedestrian Features: Sidewalk (6’), Shared-use Trail (10’), and bicycle lanes (5’)

Green Infrastructure Landscape Strip: 4’ on both sides

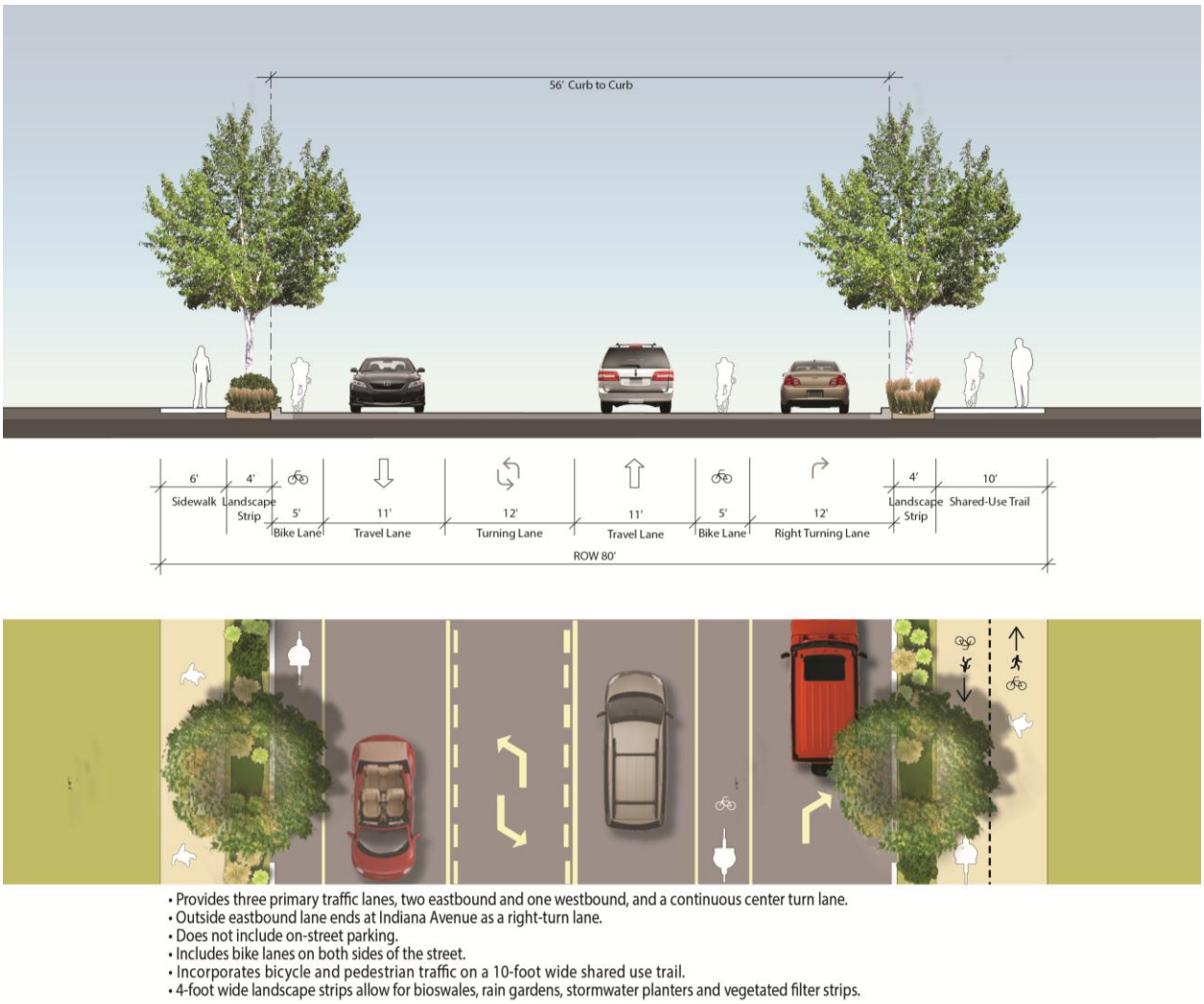


Figure 20: Recommended lane configuration between South Main Street and South Indiana Avenue. The eastbound bicycle lane would transition from being located against the curb once reaching the east side of South Grand Avenue.

In addition to the development of the new high school, the city is utilizing funds from the DOT TIGER Grant for a new viaduct project that will alleviate the need for traffic to wait for passing trains on the Kansas City Southern Railroad tracks. The proposed viaduct is designed to be four lanes of traffic with a 48-foot wide pavement width, as well as a 9-foot wide sidewalk on each side of the road that is protected by a vertical barrier. It is unclear whether the sidewalk will be fully ADA accessible due to the steep slope (8% grade) that is required to provide sufficient clearance for the trains below. The final design for the viaduct is scheduled to be complete by the fall of 2013; construction is planned for spring of 2014 with completion scheduled for January 2015. During construction, all traffic will be diverted to 15th Street, by way of South Connecticut Avenue and South Main Street.

The design, as it stands, is counter to the goals of converting East 20th Street into a Complete/Green Street. Bicycle traffic would be required to either share the road or ride on the sidewalk, both of which have safety concerns. As an alternative, without physically altering the viaduct design, bicycles could still be accommodated within the proposed pavement width by simply re-striping the lanes on the viaduct. The Complete Street version of the viaduct would utilize a two-lane section with painted medians

separating oncoming lanes and a painted buffer protecting the bicycle lanes. These two viaduct configurations are shown below.

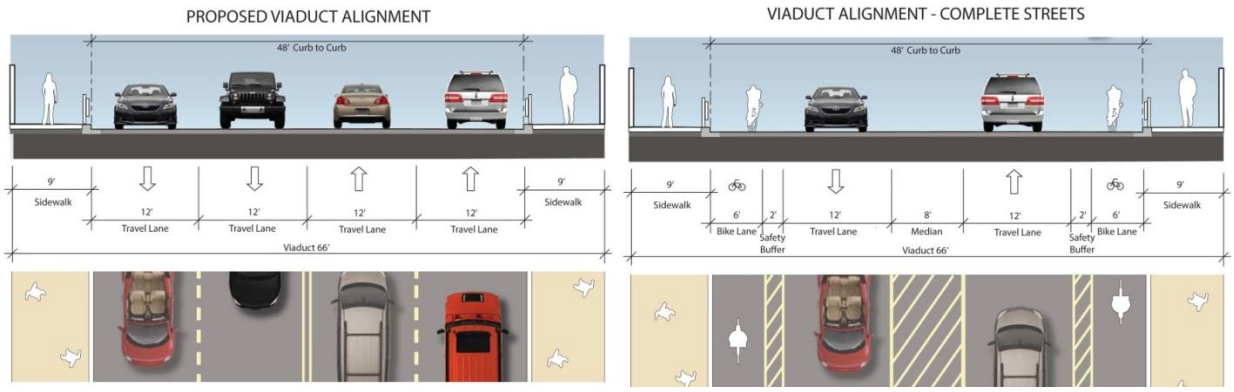


Figure 21: Proposed viaduct alignment (left), and recommended viaduct alignment (right).

Complete/Green Street Components

Initial design considerations presented to the public included a road diet from five lanes to three lanes, which included a center turning lane and one travel lane in each direction. Public feedback indicated a desire to have four lanes of traffic, with a center turn lane, but also support pedestrian and bicycle traffic. To minimize confusion, city traffic engineers will need to analyze the proposed lane configuration and ensure that proper queuing distances are well thought out from the west side of Main Street. For additional space for green features, the sidewalk and shared-use trail could be located within the high school property, allowing for additional green features to be installed along the roadway as stormwater management areas to aid with any flooding issues associated with the South Iowa Avenue Branch of Joplin Creek and the 100-year floodplain in the area. Such features should be discussed early with school officials overseeing the development of the new facility.

Transportation Elements:

- Provide high-visibility crosswalks at Main Street and East 20th Street and Indiana Avenue and 20th Street.
- Maintain signalized crosswalks at key intersections, including East 20th Street at both South Main Street and South Indiana Avenue.
- Ensure crosswalks, sidewalks, and handicap ramps are in good repair and in compliance with accessibility regulations.
- Remove the high speed right turn lane from East 20th Street onto Indiana Avenue to reduce the possibility of pedestrian and vehicular conflicts.
- Consider locations for benches, pedestrian scale street lighting, public art (Main Street), or wayfinding signage.
- Encourage businesses and key destinations, like the High School, to provide bike racks for patrons.
- Identify trolley (transit) stops and shelters that would generate heavy boarding counts, including Walgreens (currently has a shelter) and the High School. Consider trolleys that can accommodate bicycles.

- Connect to the future trail along the South Iowa Avenue Branch of Joplin Creek and provide connections into the surrounding residential neighborhoods.

Green Street Elements:

- Establish proper curb reveal and gutters as required to direct flow and ensure adequate drainage.
- Establish street trees at regular intervals. Consider planting techniques that promote tree longevity and reduce root-heaving of sidewalks, such as structural planting soils, root barriers, and root pathways. Consider "back of sidewalk" tree plantings on private property. This allows tree roots to be connected to existing lawn and yard areas, and can provide the same tree canopy benefit to the roadway as trees planted within the public right-of-way.
- Include stormwater management features, such as bioswales, rain gardens, infiltration basins, and vegetative filter strips.
- Utilize native vegetation.
- Implement pervious and high albedo pavements for bike lanes, multi-use trails, and sidewalks.

LIBRARY/THEATER (SOUTH CONNECTICUT AVENUE AND EAST 20TH STREET) NODE

This node encompasses 0.4 miles of East 20th Street between South St. Louis Avenue to South Patterson Avenue. This is the location of the future library and theater complex on the northeast corner of East 20th Street and South Connecticut Avenue. The construction of the library and theater, with potential expansion of commercial and retail facilities containing upper floor residential, would provide the community with a new visual identity for East 20th Street. The proposed development has the potential to be planned and developed in a manner that is also pedestrian and bicycle friendly, visually appealing, and could embrace East 20th Street instead of turning its back to the street. Wider sidewalks and sufficient landscaping would improve the visual quality of the development and make it an amenity along the corridor. Some of these features, such as sidewalks, have the potential to be placed on private property adjacent to the right of way, through an agreement made with the developer during the financing discussions with the city. This would open up more of the existing ROW for green infrastructure and other elements. The construction of this project will provide an ideal opportunity to incorporate the Complete/Green Street recommendations for this node. The traffic pattern and flow will change the dynamics of the area. The library and theater complex encompasses a significant portion of the overall node (Figure 34).

With a majority of the stormwater from East 20th Street draining toward Joplin Creek at Campbell Parkway, the green features of the recommended road section will help slow stormwater flow from reaching the creek. Joplin Creek flows south and currently has a culvert system bringing the water under East 20th Street and flows in open ditches along the south side of the street to the section where the TIGER grant funded sidewalk project is in the construction phase. Because this is a major collection point for stormwater, any reduction of incoming stormwater would help alleviate potential flooding issues at this collection point.

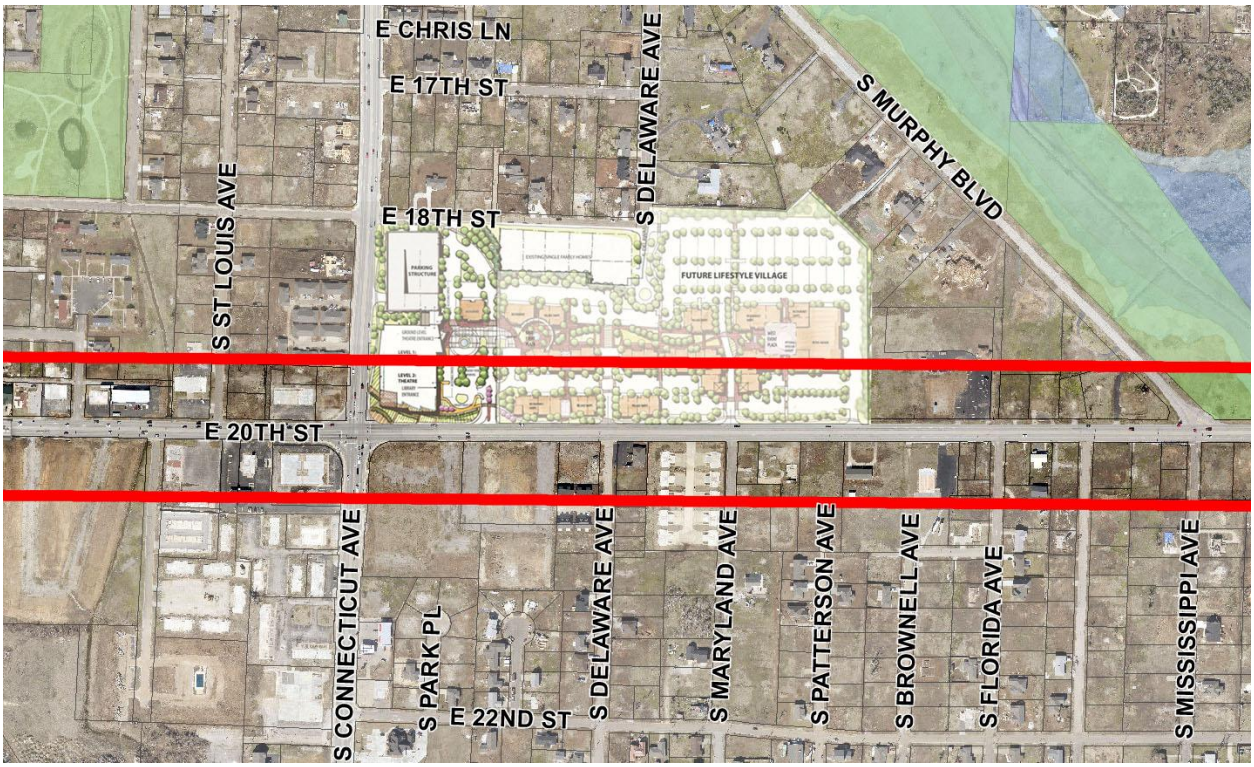


Figure 22: Aerial view of the Library node.

The newly opened Casey's General Store is located on the southeast corner of East 20th Street and South Connecticut Avenue. Recent upgrades to the sidewalks and subsurface drainage along South Connecticut Avenue could easily be tied into any Complete /Green Street features along the East 20th Street frontage.

As the parcels adjacent to the intersection of South Connecticut Avenue develop, there may be significant traffic turning into the proposed mixed-use development project. To accommodate traffic turning onto the smaller roadway, three lanes of traffic that include a continuous center turn lane and two lanes of traffic will help manage the flow of traffic and ensure that motorists traveling through 20th Street are not inconvenienced by destination-oriented traffic.

Figure 23: 20th Street near New Hampshire Avenue.

Complete/Green Street Implementation Recommendation

Number of Lanes: 3

Current ROW: Ranges from 72 to 78 feet

Lane width: 11' driving; 12' turning lane

Bicycle/Pedestrian Features: Sidewalk (6'), Shared-Use trail (10'), and bike lanes (5')

Green Infrastructure Landscape Strip: 6'- 9' on both sides

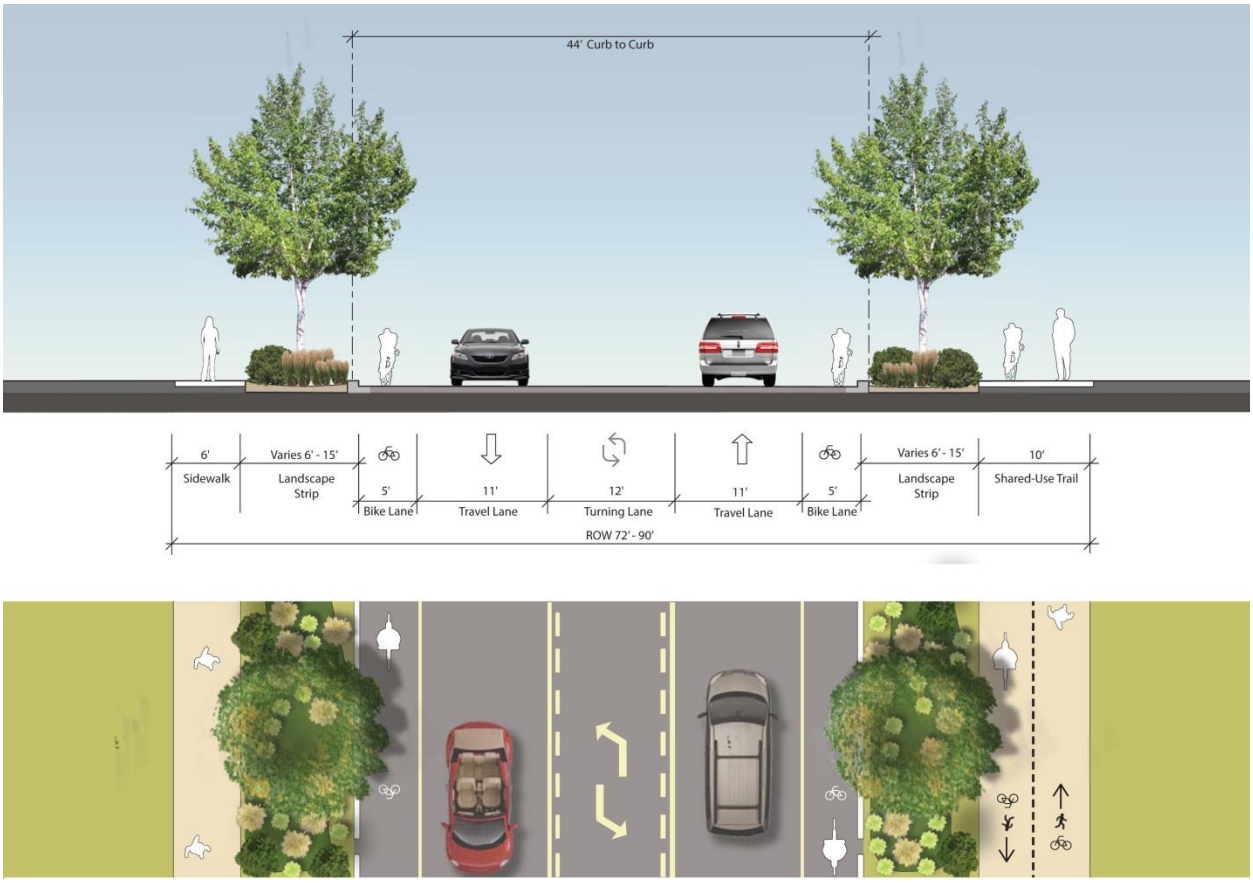


Figure 24: Recommended lane configuration for the Library node.

Complete/Green Street Components

The proposed plan for this section is to convert East 20th Street from five lanes to three lanes with a continuous center turn lane and one travel lane in each direction. Accommodations would include space for pedestrian and bicycle transportation. Because pedestrian traffic is expected to increase as a result of the proposed open air mixed-use development, it is likely best to plan for two 6-foot pedestrian sidewalks and two separate bike lanes instead of accommodating a shared, multi-use trail. This would create a safer walking environment for those around the development complex and also create a safer transportation experience for bicyclists.

The transition from the three-lane structure in the library node to the four-lane structure of the high school node would depend upon the final lane structure of the viaduct. With four vehicle lanes on the viaduct, a transition would be made east of the viaduct, between New Hampshire Avenue and the viaduct. With three vehicle lanes, a transition would occur west of the viaduct between the viaduct and South Indiana Avenue.

Transportation Elements:

- Consolidate curb cuts, which would limit vehicular access and incorporate required access to abutting properties, as appropriate.
- Adjust traffic signal timing to coincide with the real-time traffic demands, such as movies letting out at the new theater (South Connecticut Avenue intersection).

- Provide a high-visibility crosswalk at South Connecticut Avenue and East 20th Street and potentially other entrances to the library complex that align with side streets.
- Provide signalized crosswalks at key intersections, such as at South Connecticut Avenue and East 20th Street to help neighborhood residents cross to library/theater complex.
- Remove the high speed right turn movements to/from East 20th Street and South Connecticut Avenue to reduce the possibility of pedestrian and vehicular conflicts.
- Encourage businesses and key destinations, like the Library/Theater and Casey's, to provide bike racks for patrons.
- Accommodate a trolley stop and shelter at the Library/Theater and Casey's to accommodate transportation in both directions. Consider trolleys that can accommodate bicycles.
- Provide a bike lane on the south side of East 20th Street to meet the connection to the proposed multi-use development project at South Connecticut Avenue, which would minimize impact to the potential heavy pedestrian traffic coming out of the shopping district.

Green Street Elements:

- Establish proper curb reveal and gutters, as needed, to direct flow and ensure adequate drainage.
- Establish street trees at regular intervals. Consider planting techniques that promote tree longevity and reduce root-heaving of sidewalks, such as structural planting soils, root barriers, and root pathways. Consider "back of sidewalk" tree plantings on private property, which allows tree roots to be connected to existing lawn and yard areas and can provide the same tree canopy benefit to the roadway as trees planted within the public right-of-way.
- Include stormwater management features, such as bioswales, rain gardens, infiltration basins, and dry swales.
- Include native plantings.
- Consider high albedo or pervious pavements for bike lanes, multi-use trails, and sidewalks.

CAMPBELL PARKWAY NODE

This area focuses on East 20th Street from South Range Line Road to SE Murphy Boulevard and includes Campbell Parkway and Joplin Creek. The Campbell Parkway node is also the focus area of the TIGER Grant Sidewalk Project, as well as property acquisitions for stormwater improvements associated with Joplin Creek and Campbell Parkway. The construction of these projects provides an ideal opportunity to incorporate the Complete/Green Street recommendations for this node. The pedestrian access and stormwater improvements will already change the landscape of the area. As can be seen in the figure below, Campbell Parkway and Joplin Creek encompass a significant portion of the overall node. This area should have a focus on green features for stormwater enhancement, as well as pedestrian connections to Campbell Parkway's trail system, the new sidewalk along East 20th Street, and a pedestrian connection to South Highview Avenue and South Range Line Road.

With a majority of the stormwater from East 20th Street in this area draining towards Joplin Creek at Campbell Parkway, the green features being recommended for this road section will help slow stormwater flows from reaching Joplin Creek. Joplin Creek flows south and currently has a culvert system bringing the water under East 20th Street, and flowing in open ditches along the south side of East 20th Street, to the section of this street where the sidewalk project is in the construction phase. As this is a major collection point for stormwater, any reductions of incoming stormwater would help alleviate potential flooding issues at this collection point.

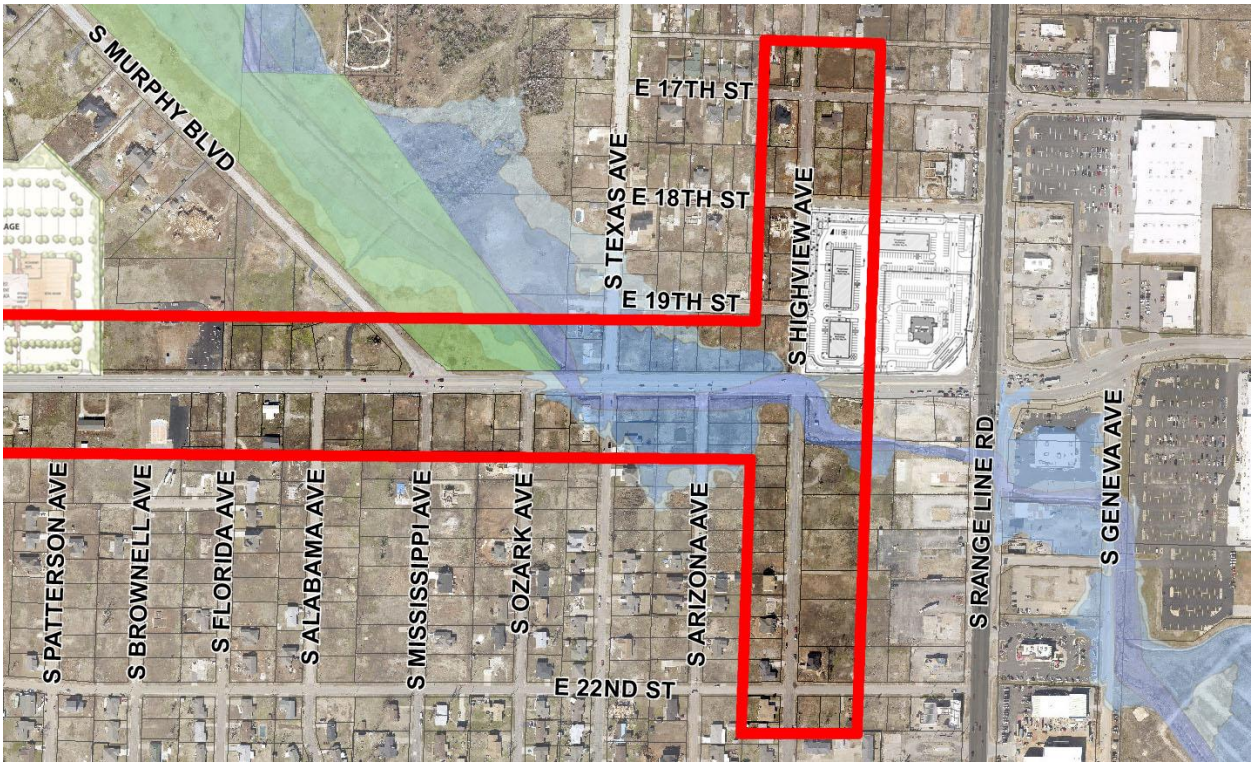


Figure 25: Aerial view of the Campbell Parkway node.

Figure 26: Photo of Joplin Creek at Campbell Parkway.

Figure 27: Photo of East 20th Street, looking west towards SE Murphy Boulevard.

The DOT Tiger Grant 20th Street sidewalk project offers an opportunity to leverage additional federal resources within this corridor. As part of the sidewalk project, city officials expressed an interest in acquiring the four parcels on the south side of East 20th Street at Campbell Parkway, between Texas Avenue and South Highview Avenue. This sidewalk project, which is on a quick timeframe, will include a trolley stop on the south side of East 20th Street at the intersection with South Murphy Boulevard. Including elements of green complete street design within this key node will be a promising start for the entire corridor by giving residents an opportunity to see what green infrastructure practices look like.

The City of Joplin Parks Department has active or pending park improvement projects at Parr Hill Park, Campbell Parkway, and Joplin Creek. These parks provide opportunities for connections to 15 miles of trails in the city. As projects are completed, trails and sidewalks should include respites (benches and rest areas), shelters, bike racks, and wayfinding (maps and signage).

Complete/Green Street Implementation Recommendation

Number of Lanes: 3

Current ROW: ranges from 80’ to 85’

Lane width: 11’ driving; 12’ turning lane

Bicycle/Pedestrian Features: Sidewalk (6’), multi-use trail (10’), and bike lanes (5’)

Green Infrastructure Landscape Strip: 10’-12.5’ on both sides

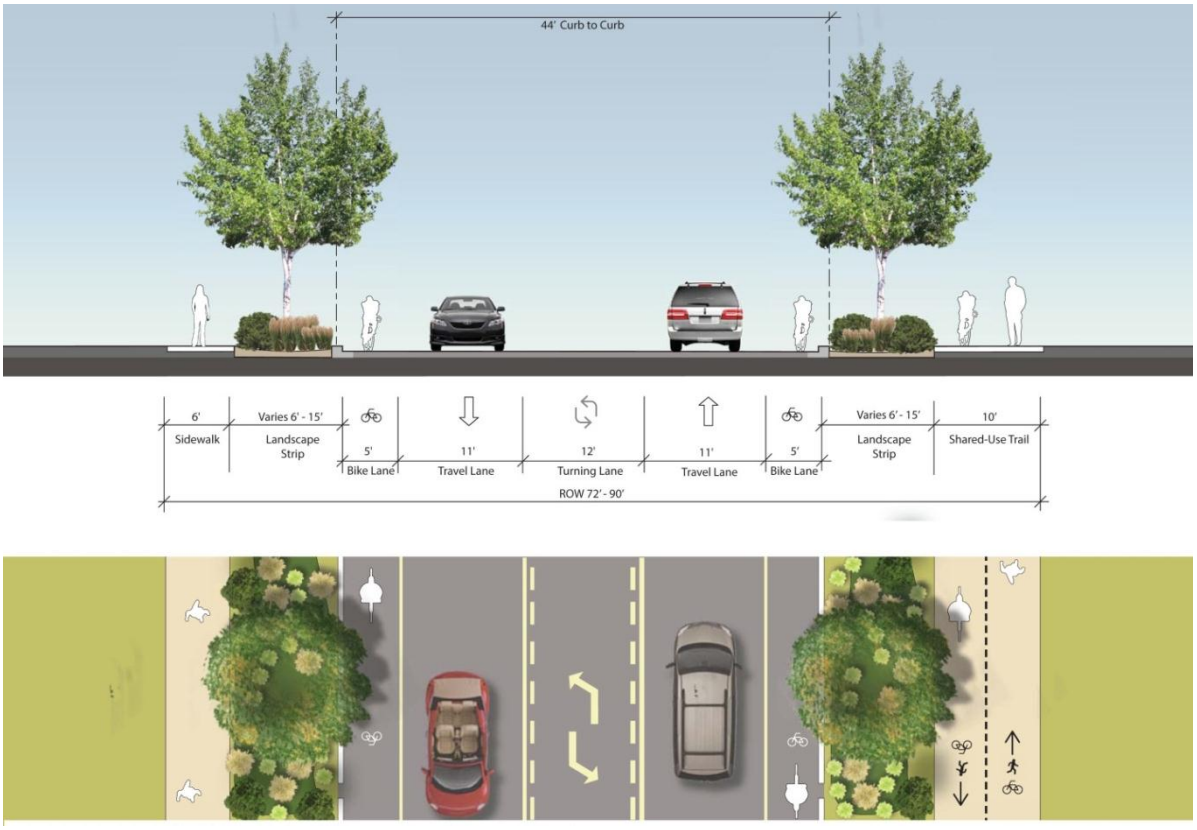


Figure 28: Recommended lane configuration for the Campbell Parkway node.

Complete/Green Street Components

The connection to Campbell Parkway and Joplin Creek provide an opportunity to incorporate significant green infrastructure elements to improve the aesthetics of the park, address stormwater management, and improve the storage capacity and infiltration of the basin for Joplin Creek. Public input received during the June 2013 design workshops indicated positive feedback about including a round-a-bout at the intersection of East 20th Street and SE Murphy Boulevard. The round-a-bout may serve as a gateway to the re-envisioned East 20th Street corridor and help ease and slow traffic flow. This is an engineering decision that the city should review and decide upon. A round-a-bout may help manage traffic, but the public also indicated concerns about additional side traffic onto SE Murphy Boulevard, which is a residential street. Additional traffic engineering studies would be required to determine if a round-a-bout is appropriate for this intersection. In addition, the city would likely need to acquire additional land to construct a round-a-bout at this location.

Figure 29: Campbell Parkway round-a-bout option.

The recommended lane structure for this node includes three lanes of traffic with a continuous center turn lane and one travel lane in both directions. The north side of East 20th Street is a great point to start a multi-use trail that could eventually connect to the planned trails through Campbell Parkway and service bicycle and pedestrian users along the East 20th Street corridor. The south side of East 20th Street should include a sidewalk and the possibility for a bike lane.

While the portion of East 20th Street, east of South Highview Avenue was not part of this project, consideration was given to the existing vehicle lane structure of East 20th Street to South Range Line Road which is a major north-south arterial road. The proposed three lane structure would require a transition from the lane structure turning onto East 20th Street from South Range Line Road. It is recommended that the two left turning lanes, accessing East 20th Street from northbound on South Range Line Road converge into one westbound lane and one left turn lane at South Highview Avenue. This will help maintain truck and bus access, as well as provide space for Complete/Green Street elements. The eastbound lane structure can remain as they are now with the five lanes fed from the one lane of the Campbell Parkway node.

Transportation Elements:

- Adjust traffic signal timing to coincide with the real-time traffic demands. The SE Murphy Boulevard intersection could benefit from this type of system as it currently has angled geometry and poor visibility.
- Provide signalized crosswalks at key intersections like SE Murphy Boulevard.
- Provide benches, pedestrian scale street lighting, public art, and wayfinding. Campbell Parkway is an ideal location to spend money on public infrastructure since it is a major green space within the city and would have a high degree of visibility.
- Trail connections should be made through Campbell Parkway to follow Joplin Creek and connect to 15th Street, as well as the overall regional trail network.

- Provide bike racks at specific destinations. Campbell Parkway will be a major destination for bicyclists and should provide sufficient locations for bicycle parking.
- Provide trolley shelters at locations where there are heavy boarding counts.

Green Street Elements:

- Establish proper curb reveal and gutters as required to ensure adequate drainage.
- Establish street trees at regular intervals. Consider planting techniques that promote tree longevity and reduce root-heaving of sidewalks, such as structural planting soils, root barriers, and root pathways. Consider "back of sidewalk" tree plantings on private property. This allows tree roots to be connected to existing lawn and yard areas, and can provide the same tree canopy benefit to the roadway as trees planted within the public right-of-way.
- Add sufficient vegetation to Campbell Parkway to create a visual amenity for users of the public space.
- Include stormwater management features, such as bioswales, rain gardens, vegetative filter strips, riparian buffers, and infiltration basins.
- Expand Joplin Creek within Campbell Parkway and transform into more of an aesthetic amenity. On the south side of East 20th Street, the creek should have the concrete removed to soften the look and make the creek appear more natural.
- Consider pervious and high albedo pavements for bike lanes, multi-use trails, and sidewalks.
- Incorporate interpretive signage explaining green infrastructure and associated benefits, as well as natural benefits of Joplin Creek and the surrounding park.

SOUTH HIGHVIEW AVENUE NODE

South Highview Avenue is predominantly a residential area that lies directly adjacent to South Range Line Road's commercial strip. This route potentially creates a bypass or shortcut to avoid the busy intersections and traffic signals along South Range Line Road. Area residents would like to see green/complete street features that are pedestrian friendly and can also be used for traffic calming to act as a deterrent for vehicles using this road as a bypass route. Green street designs would also alleviate the residents' concern about the rear view of commercial properties along South Rangeline Road along with the potential increase of truck delivery access . While this project focused on the area between East 17th Street and East 22nd Street, features could easily be extended from East 24th Street to East 7th Street, which is the entire length of South Highview Avenue.

With a majority of the stormwater from South Highview Avenue in this area draining towards East 20th Street, the green features of the recommended road section will help slow stormwater from reaching the drainage ditches and the TIGER grant sidewalk improvements project. As this is a major drainage route for stormwater into Joplin Creek, any reductions of incoming stormwater would help alleviate potential flooding issues along East 20th Street.

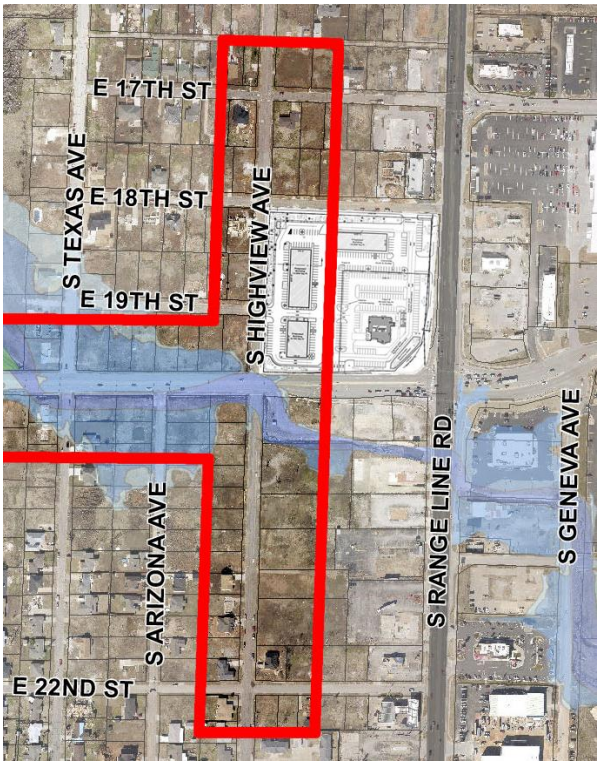


Figure 30: Aerial view of the South Highview Avenue node.

Figure 31: Photos of South Highview Avenue.

Complete/Green Street Implementation Recommendation

There are two potential recommendations and treatments for South Highview Avenue. The first configuration is most applicable to the portion of South Highview Road that is located south of East 20th Street. In this location, the adjacent parcels front directly onto South Highview Road, and since most of these parcels are residential lots, there is a likely demand for on-street parking spaces that could be used by visitors or residents. As shown in Figure 44, a continuous parallel parking lane is provided in order to accommodate the needs of the residents.

The second roadway configuration is most applicable to the portion of South Highview Road that is located north of East 20th Street. In this location, the residential properties that abut the west side of South Highview Avenue front onto the side streets of East 17th, East 18th, and East 19th Streets so there is no inherent need to accommodate on-street parking within the South Highview Avenue ROW. As shown in Figure 45, the greater need is to buffer the potential noise issues that may arise from the adjacent commercial area that abuts the east side of South Highview Avenue. Increasing the width of the sidewalk and landscaped buffer zone on both sides of the road will help minimize the noise levels coming from the commercial area.

Number of Lanes: 2

Current ROW: 60 feet

Lane width: 11’ driving

Bicycle/Pedestrian Features: Sidewalks (5’) each side

Green Infrastructure Landscape Strip: 6’- 23’ with wider landscaping on the east side

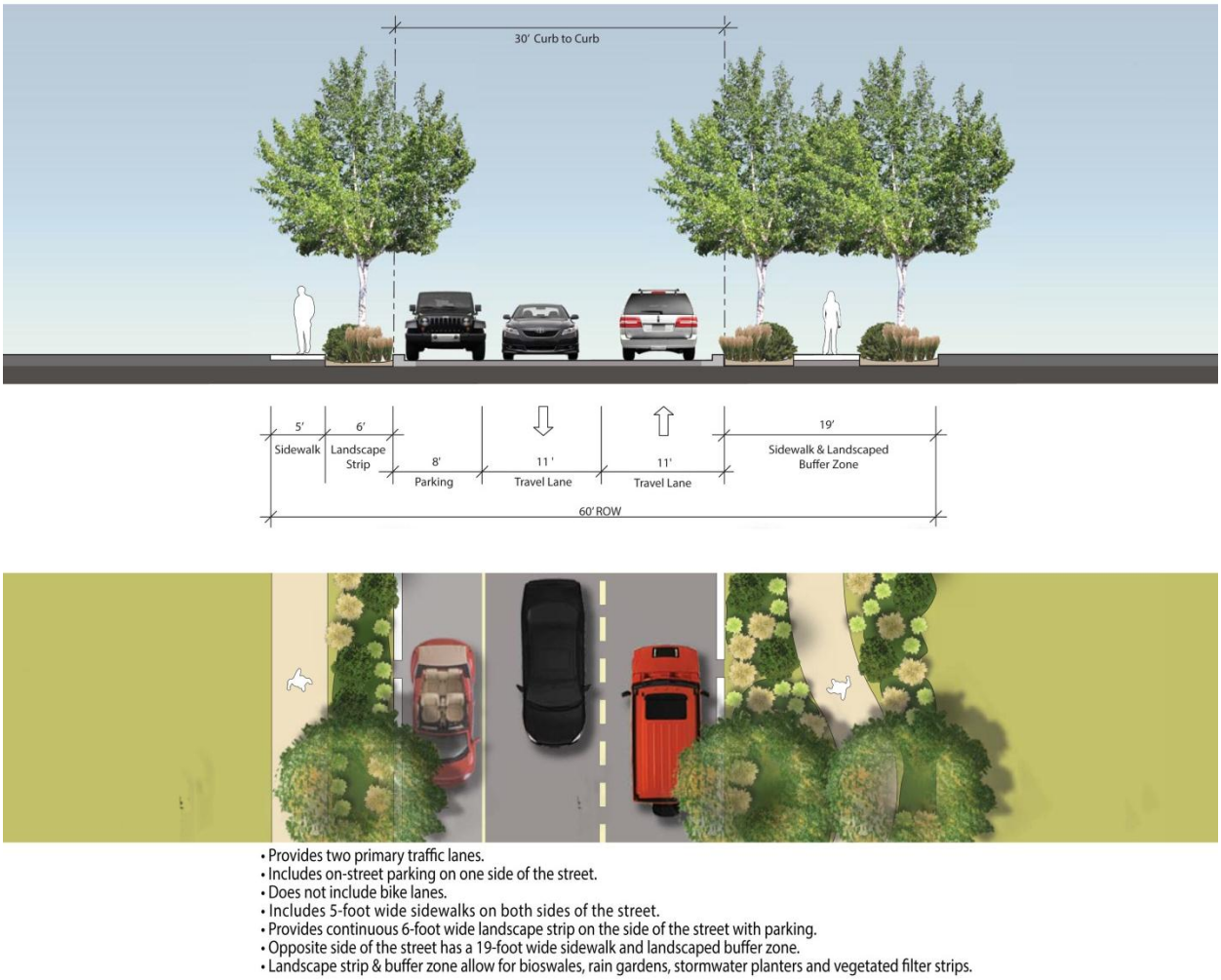


Figure 32: South Highview Avenue configuration south of East 20th Street.

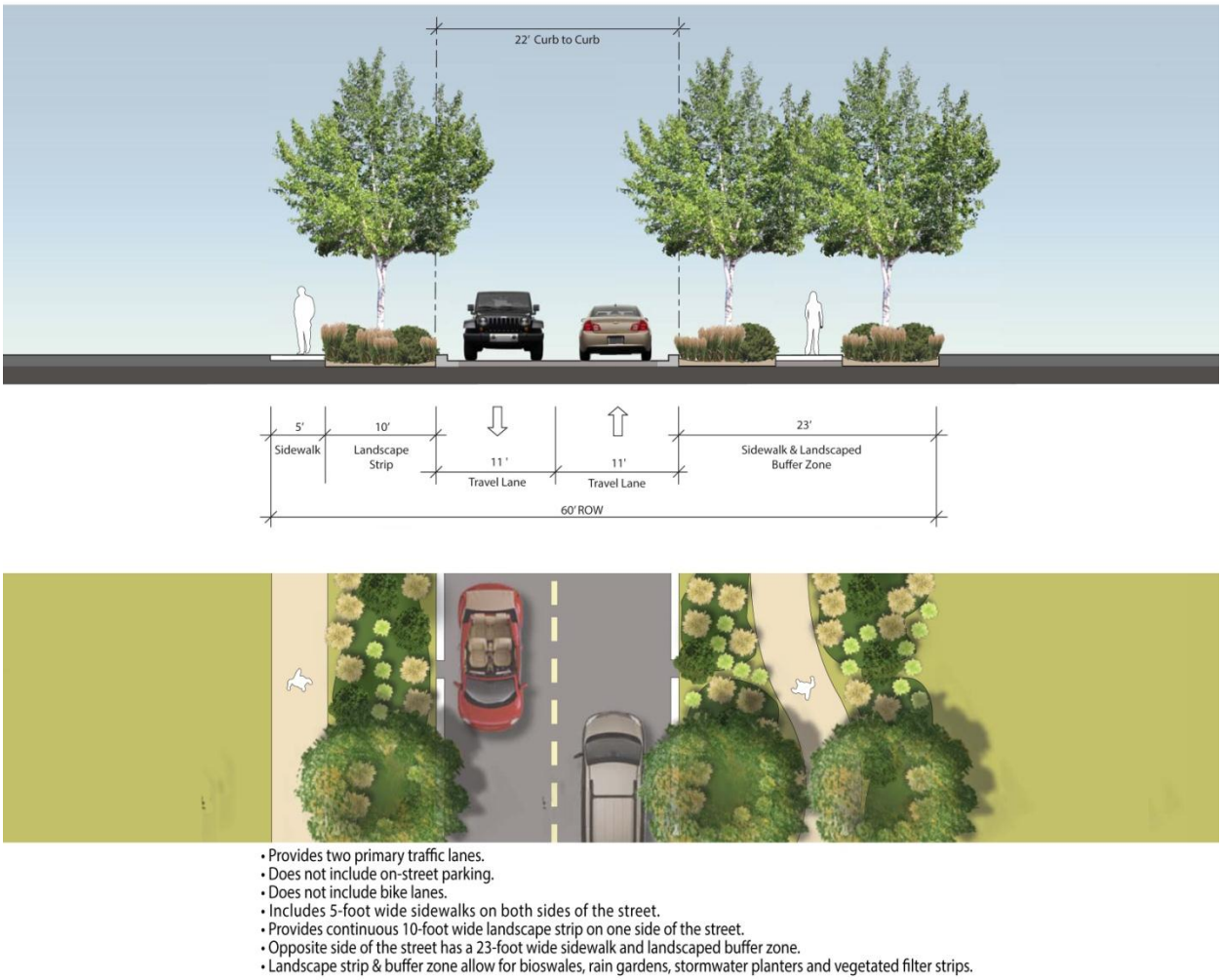


Figure 33: South Highview Avenue recommended configuration on the north side of East 20th Street.

Transportation Elements:

- Provide a high-visibility crosswalk at South Highview Avenue and East 20th Street.
- Provide signalized crosswalks at key intersections, especially at South Highview Avenue and East 20th Street. Ensure crosswalks, sidewalks, and handicap ramps are in good repair and in compliance with accessibility regulations.
- Provide mid-block pedestrian crossings on South Highview Avenue south of East 20th Street to: aid pedestrians traveling east and west; and allow them to cross South Highview Avenue safely since there are no street intersections between East 20th and East 22nd Streets.
- Reduce pavement width, as current width is too wide for the residential neighborhood. Narrower lanes will slow the rate of speed and potentially deter vehicles likely to use it as a bypass for South Range Line Road. A two-lane roadway is sufficient to carry the local traffic.
- Create parking facilities for the section of South Highview Avenue that is south of East 20th Street since there are many residential properties that directly front onto South Highview Avenue and would benefit from the availability of visitor parking areas.

- Consider locations for benches, pedestrian scale street lighting, or wayfinding signage.
- Connect to the new sidewalks of the TIGER Grant sidewalk project and provide connections into the surrounding residential neighborhoods.

Green Street Elements:

- Establish proper curb reveal and gutters as required to direct flow and ensure adequate drainage.
- Establish street trees at regular intervals. Consider planting techniques that promote tree longevity and reduce root-heaving of sidewalks, such as structural planting soils, root barriers, and root pathways. Consider "back of sidewalk" tree plantings on private property. This allows tree roots to be connected to existing lawn and yard areas, and can provide the same tree canopy benefit to the roadway as trees planted within the public right-of-way.
- Shift the roadway to the west to leave more space on the east side of the roadway and provide visual screening of the adjacent commercial uses, and to provide stormwater management features, such as bioswales and rain gardens.
- Include stormwater management features, such as bioswales curb extensions, curb cuts, and rain gardens.
- Include periodic curb bulb outs to provide a location for mid-block crossings as well as to narrow the street in several locations to slow down traffic.
- Implement pervious and high albedo pavements for bike lanes, multi-use trails, and sidewalks.

Future Considerations

Policy and Code Audit

Complete/Green Streets policies formalize the community's intent to plan, design, and maintain streets that are safe and sustainable for users of all ages and abilities. These policies require transportation planners and engineers to design and construct within the ROW to accommodate all anticipated users, including pedestrians, bicyclists, public transportation users, motorists, and freight vehicles. EPA's technical assistance to Joplin included a review of current Joplin policies that would impact Complete/Green Streets (Appendix VII). This review included the following policies:

- Joplin Moving Forward – 2012 Comprehensive Plan (Comp Plan)
- City of Joplin Zoning Regulations (Zoning), including Subdivision Regulations
- Joplin Stormwater Management Criteria

In general, Joplin's Comp Plan currently addresses multi-modal transportation and green infrastructure features, thus embracing the concepts of Complete/Green Streets and green infrastructure. To maximize the potential implementation and benefit of Complete/Green Streets, the following provides specific policy recommendations on statements within the Comp Plan.

The City's Comp Plan, updated in 2012, lays the groundwork and vision for Joplin's future. Joplin's current zoning regulations were adopted on December 5, 2004. Changes to the Comp Plan, both in 2012 and the suggested changes noted in the policy review herein, are not specifically addressed in the current zoning regulations. As such, many of the features outlined in the Comp Plan are not found in the zoning regulations. Inconsistencies exist between the Comp Plan, Comp Plan's Design Standards, and the zoning regulations. The zoning regulations do not specifically embrace the implementation of Complete/Green Streets and green infrastructure concepts. A code update is scheduled for 2013, with an update to the Comprehensive Plan and zoning codes for 2014. It is recognized that recommendations provided by EPA will be addressed during this process.

Specifically for the East 20th Street and South Highview Avenue corridor, the current configuration of the zoning district map includes multiple zoning districts with varying regulations for each district. Future land use goals and development patterns are inconsistent between the policies reviewed, the goals expressed by the City staff, and the public opinion expressed during the June 2013 Design Workshop. In order for a Complete/Green Street policy to be effective in the long term, these items need to be determined, defined, and incorporated into each policy.

Aligning Resources

The City of Joplin continues to support the planning document, *Blueprint for the Future*, which captured ideas and proposed developments that embrace the future. Funding from the U.S. Housing and Urban Development Community Development Block Grant (CDBG) program was recently provided to support a streetscape project along East 20th Street, which includes providing sidewalks with pedestrian-friendly amenities on both sides of East 20th Street from South Main Street to South Range Line Road. This funding is a crucial first step to developing a Complete/Green Street along this corridor.

Joplin can embrace opportunities provided by other federal funding sources to promote Complete/Green Streets. The use of DOT TIGER funding to build sidewalks from Campbell Parkway to South Highview Avenue helps promote walkability within the corridor. Additionally, the viaduct construction over the Kansas City Southern railroad near the high school will include sidewalks on both

sides of the road and four lanes of traffic. Both projects are promoting pedestrian access and safety and can build momentum for additional sidewalk connections to be made throughout the corridor.

Joplin also received funding from FEMA for stormwater repairs (catch basins) damaged by the tornado. Efforts should be made to incorporate green infrastructure into those repairs, where possible. The City of Joplin Parks Department has active or pending park and trail improvement projects at Parr Hill Park, Campbell Parkway, and Joplin Creek. These parks and trails provide an opportunity for connections to 15 miles of trails within the city. As projects are completed, trails and sidewalks should include respites (benches and rest areas), shelters, bike racks, and wayfinding features (maps and signage) . Recommendations in this report provide details on how such connections can be made.

With the various projects along East 20th Street already underway , the city has the opportunity to incorporate Complete/Green Street features into these projects, as well as beginning to phase their incorporation along the corridor adjacent to the designated nodes, . For instance, the SRA Team has provided comments to the city's contractors on the design of the sidewalk project between Campbell Parkway and South Highview Avenue for this project to provide space for green infrastructure features by locating the sidewalk along the property lines. Other upcoming Parks Department projects include stormwater features and tree planting along Campbell Parkway. These features could be incorporated and extended into Complete/Green Street designs at the intersection of SE Murphy Boulevard and East 20th Street. The construction of the new high school has the opportunity to incorporate Complete/Green Street features at the intersections along East 20th Street. The high school and Campbell Parkway nodes have an immediate opportunity to incorporate the multi-modal transportation options of Complete/Green Streets as transit, pedestrian, and bicycle usage go hand in hand with these uses.

The planned viaduct on East 20th Street will have a major impact on this corridor. The viaduct is currently designed to have four travel vehicular lanes, two in each direction, with sidewalks on both sides. In the current East 20th Street configuration, the five lanes (two in each direction and one center turn lane) will be transitioned to four travel lanes (two in each direction). This, combined with the new high school, could provide the opportunity to restructure the vehicular lanes and incorporate the recommended road section of Complete/Green Streets from the viaduct to South Main Street.

Following the success of the CART process, and building on the work being done with other ongoing projects, such as the high school, sidewalk, stormwater, viaduct, and Campbell Parkway projects, the community has momentum for implementing changes along the East 20th Street corridor. A phased approach to the implementation of Complete/Green Streets can weave the changes already underway with the goals of creating a Complete/Green Street.

Suggested "next steps" for moving forward with Complete/Green Streets implementation along this corridor, including key policies, ideas and strategies, are as follows;

- Site *Investigations* – Initial site investigations will help provide a baseline understanding for future engineering implementation.
    - Conduct a planning level traffic study to test a road diet concept. Investigate adaptive traffic control as an operational enhancement to maximize traffic throughput. This is a low cost technology application to optimize the capacity.
    - Accurate survey data/mapping, additional field evaluation and/or engineering analysis will be required prior to advancing the concepts which follow.
- Complete/Green Streets Tools, Operations, and Maintenance – Start simple and place in locations that will not create maintenance issues.

- Strategically time the location of Green Streets features to work into the City's municipal budget, where a feature that may require expensive maintenance equipment (e.g., vacuums) can be included in a future budget, and not installed in the earlier phases of installation.
- Do not "over-engineer" initial Complete/Green Streets solutions – go simple with bio-swales and vegetated filter strips in an effort to reduce long-term maintenance requirements.
- Select Complete/Green Streets solutions that do not require the upfront purchase of costly maintenance equipment (e.g., shoveling sediment from catch areas vs. vacuuming).

- Funding – In this time of limited budgets, the funding of Complete/Green Streets implementation tools (capital, operation, and maintenance, etc.) will be a challenge. Creative funding solutions, such as incorporating simple and inexpensive Complete/Green Streets implementation tools with scheduled minor roadway improvements, or combining a variety of funding sources for one project, will most likely be necessary.
- *Regulatory* – Joplin should work within their regulatory framework to provide incentives for Complete/Green Streets Implementation.
  - Revise the city's zoning and subdivision regulations, including routes that incentivize Complete/Green Streets implementation.
  - The city cannot require anything from private developers that the city does not do itself. Therefore the city may consider creating a list of Complete/Green Streets implementation tools (permeable pavers, rain gardens, shared streets, etc.), begin installing them, and then publicize it so that the development community can learn from those public demonstration projects.
  - Install Complete/Green Streets implementation tools immediately, when feasible, to keep the community positioned well ahead of any real or perceived impacts resulting from more stringent regulatory requirements (e.g., stormwater) that are anticipated in the future.
- *Education/Outreach* – Joplin should work with area residents, business owners, and developers to outline the city goals with regard to Complete/Green Streets. Tours of features, such as rain gardens, can enhance the community's acceptance of these features, while providing information operation and maintenance.
- *Identity* – Joplin has the opportunity to plan and create a vision for the future of the East 20th Street corridor. That vision can enhance the features being proposed, as well as attract the type of land uses that support that identity. A branding campaign including signage can highlight the corridor's history and new identity. Given the public and civic uses already planned, emphasis should on the corridor becoming the civic corridor of the city.
- *The Plan* – In order for private development to meet the goals of the Complete/Green Streets, the city should create an overall plan for the corridor. This would provide guidance for developers and property owners to plan for their development while also meeting the corridor's goals.